July 1943

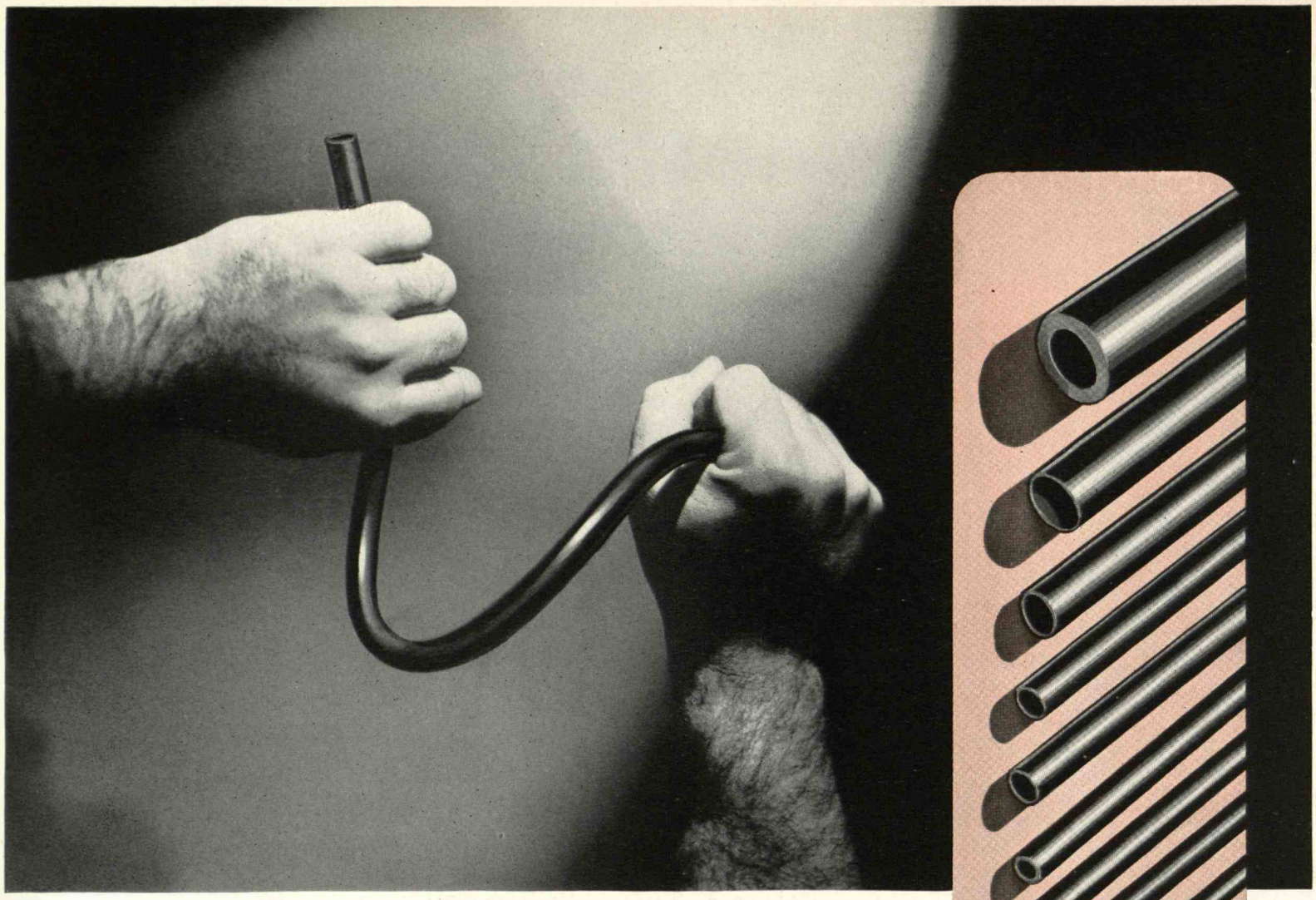
TECHNOLOGY REVIEW

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Strong, Pliable, with Excellent Electrical Characteristics

Sandee
FLEXIBLE PLASTIC TUBING

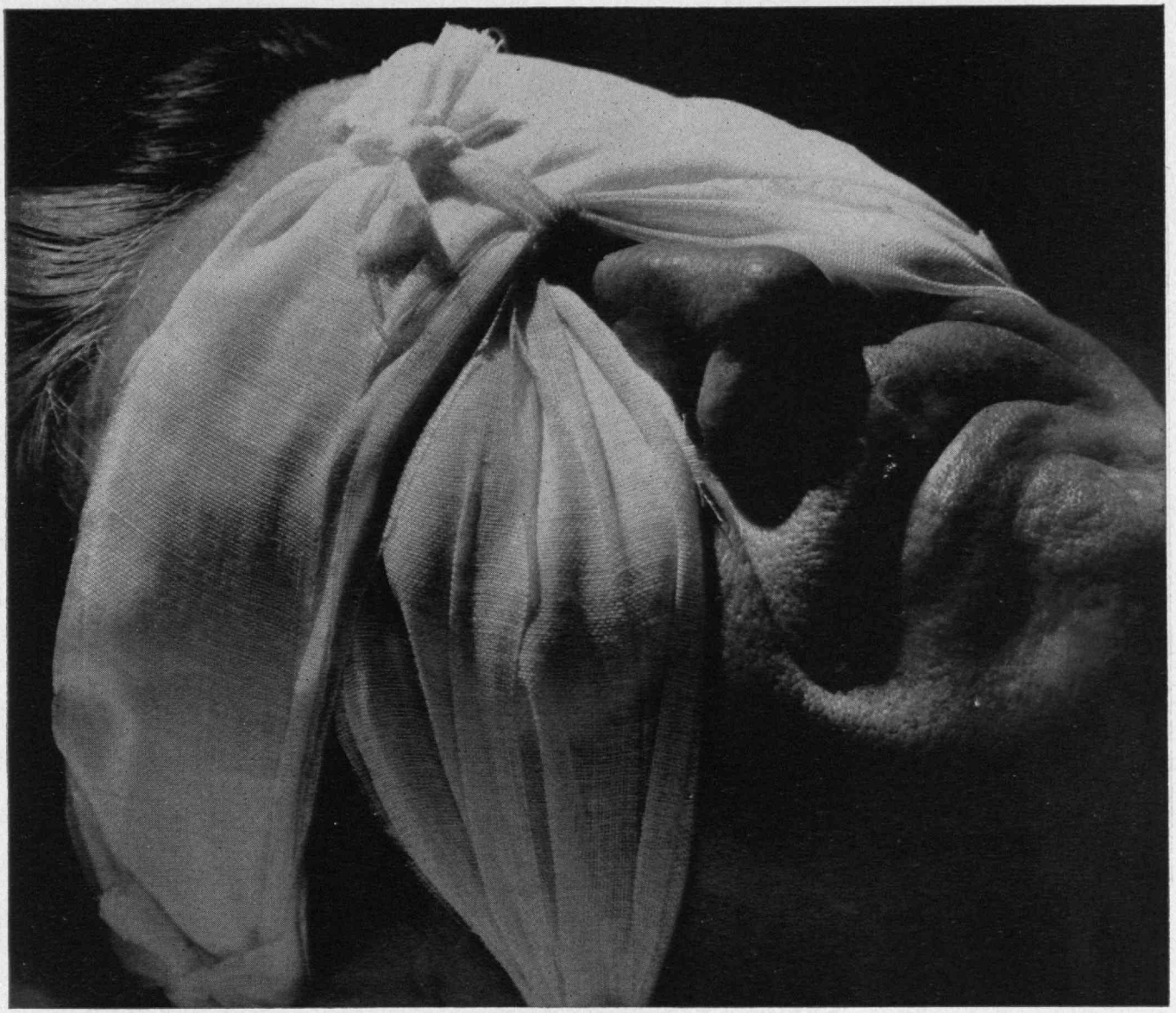
THE demand for this VERSATILE Plastic Tubing has grown tremendously with the scarcity of rubber, tin, aluminum and other crital materials. Electrical War Industries have found many applications where SANDEE Flexible Tubing has proved more efficient than materials previously used! This remarkable product has *excellent electrical characteristics*, and is highly resistant to oils, acids, greases. It possesses ample tensile strength which can be further increased with woven fabric covering. Sandee Flexible Tubing is precision-made of transparent or opaque materials, in different colors, dull or glossy finish. It is custom made in various degrees of thickness and flexibility, in many sizes and lengths. This tubing serves efficiently for wire and cable insulation, antenna and transformer leads, cable end sleeves, grommets, cushions, battery drains, oil lines, air hosing, and wherever a tough, protective covering is required. SANDEE Extruded Thermoplastics are also formed into many different stock and custom sections to exacting specifications. Write today for samples, catalog sheet, and complete information.

ELMER SZANTAY, M.E. '35, *GENERAL MANAGER*

Sandee Manufacturing Company

3945 NORTH WESTERN AVENUE • CHICAGO, ILLINOIS

EXTRUDED PLASTICS AND SPECIAL TOOLS



Your Workers, Your Company, Your Country All Lose—*with "Lost-Time Eyes"*

. . . protect workers' eyes with AO Goggles

What does a worker think about while lying in a hospital bed or at home, suffering from an injured eye? He thinks of his own pain . . . the worry of his family . . . his lost time. He builds up a resentment against his company for not providing him with the proper eye protection.

But an eye-injured worker is not the *only* loser. Companies that *allow* "lost-time eyes" to happen also lose heavily in hard-earned dollars, irreplaceable workers, invaluable production. And as a result, our Country . . . for which we are all fighting . . . loses heavily, too, in vital war equipment.

Give your men and women workers AO Goggles to give our fighting forces *what they must have for Victory*. AO Goggles are strong and sturdy . . . yet they are also light and comfortable. Equipped with Super Armorplate Lenses, they provide maximum protection against impact. Have your Safety Director get in touch with the nearest American Optical office.

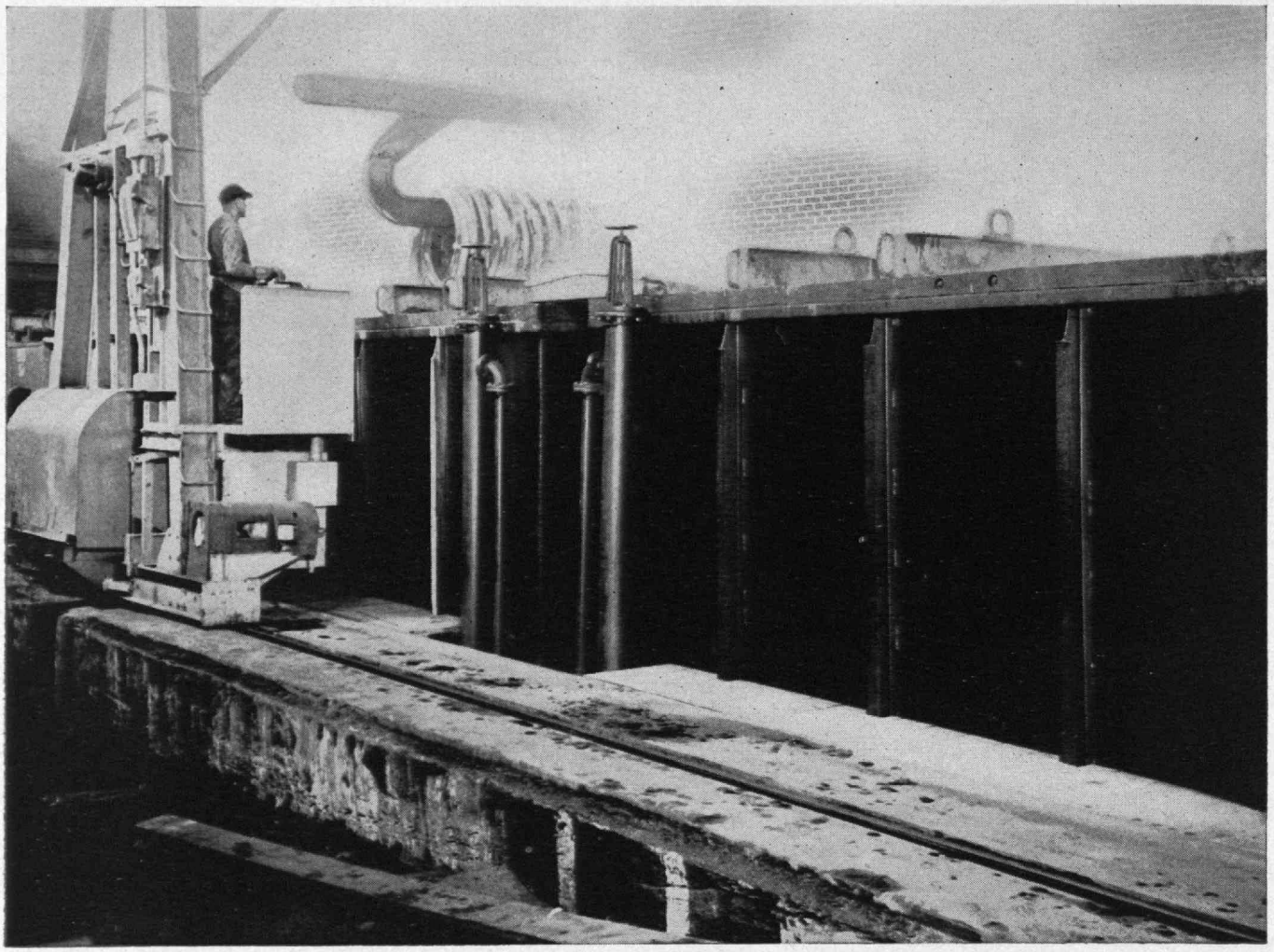
ARMY E NAVY

American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS

MANUFACTURERS FOR 110 YEARS OF PRODUCTS TO AID AND PROTECT VISION. BRANCHES IN ALL PRINCIPAL INDUSTRIAL CENTERS

THE TECHNOLOGY REVIEW, July, 1943. Vol. XLV, No. 9. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.



EVEN HOT SULPHURIC ACID CAN'T DULL THE GLOSS OF TYGON PAINT!

PAINT seldom faces a tougher job than when used on the exterior of hot, non-ventilated pickling tanks. In addition to the viciousness of the fumes arising from hot sulphuric acid, there is the frequent spillage that occurs, plus the moisture which aggravates any corrosive condition.

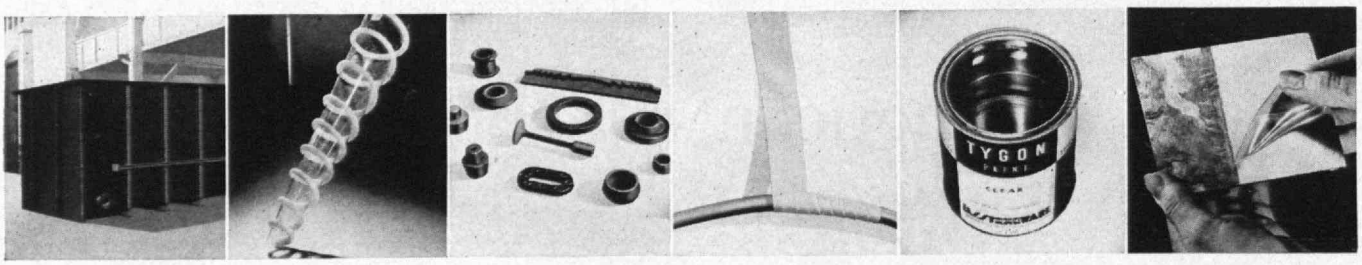
In this toughest kind of service, where the life of most industrial paints is measured in terms of but a few months (sometimes but a few weeks) Tygon Paint is still taking it, the original gloss not even dulled after more than fifteen months!

The reason? Tygon Paint is, essentially, pure Tygon (the chemically inert, rubber-like plastic used to line tanks in which corrosives are made and handled) liquefied by the addition of appropriate solvents. These solvents, on evaporation, leave a sturdy, durable film of chemically unchanged Tygon.

Tygon Paint films are odorless when dry, tasteless, and relatively non-toxic (they may be formulated to be totally non-toxic, if desired). The films are tough, flexible, and non-inflammable. Tygon Paints show no tendency to crack, craze, check or "weather" even after long exposure to air, sunlight, moisture or other oxidizing elements. They are highly resistant to acids, alkalies, alcohols, greases, oils and fats. Certain formulations will even withstand hot aromatic fuels.

For detailed information on the use of Tygon Paints, and other Tygon corrosion-resistant materials: linings, rigid or flexible tubing, gasketing materials, impregnating solutions, or molded Tygon products, write: U. S. Stoneware Company, Akron, Ohio. In Canada: Chamberlain Engineering, Ltd., Montreal, Que.

U. S. STONEWARE
AKRON, OHIO



Give him the RIGHT GRINDING WHEEL

then let the Grindlins heckle



Yes, he's got to have a good weapon in the shop, too.

This combination for example—grinding steel castings, with high speed equipment, a rough and tough sort of a job, calls for a grinding wheel built for heavy duty and high speed.

You'd order for this job a Norton Resinoid bonded wheel, Alundum abrasive; and if without experience with this kind of work, you'd consult a Norton engineer, or a Norton distributor for more specific recommendations.

There is a Norton grinding wheel for every type of grinding. Your shop army must have the right equipment

NORTON COMPANY • **Worcester, Massachusetts**

Behr-Manning, Troy, N. Y. is a Norton Division

NORTON ABRASIVES



IRC RESISTORS Send the Signal

When trouble develops on a high voltage power line, time is of greatest essence. For in our fast-moving electro-mechanical age, minutes quickly translate themselves into countless man-hours. Communications go "dead" . . . lights snuff out . . . vital production grinds to a sudden halt . . . and it's "taps" for a busy world.

Another IRC Contribution

Until comparatively few years ago, when power transmission interruptions occurred, it often required hours to locate the trouble. Today, thanks in part to the contribution of I R C research engineers, the point of disruption in any electrical circuit—whether power or communications—can readily be spotted in a matter of moments.

Specially designed, IRC high voltage power resistors dependably dissipate the heavy loads and deliver the voltage required to operate trouble-signalling mechanisms. On receipt of signal, other instruments in which resistors play an important role accurately locate the point of disturbance within a few feet.

Here at I R C we welcome—and usually solve—unusual problems in the field of resistance devices. And because I R C makes more types of resistance units, in more shapes, for more applications than any other manufacturer in the world, many leading engineers make it a point to seek our unbiased counsel. There is no obligation, of course.

★ PREFERRED FOR PERFORMANCE ★
IRC
★ FIXED & VARIABLE RESISTORS ★

INTERNATIONAL RESISTANCE COMPANY

423 N. BROAD STREET · PHILADELPHIA

PENFLEX WELD

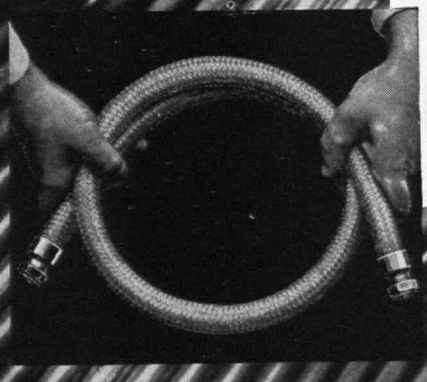
Corrugated Flexible All-Metal Tubing for Safety and Service on High Pressure Lines that MUST be Leak-proof

Flexibility combined with safety against all normal hazards; resistance to radial and longitudinal strains under high pressure; jointless, welded, leak-proof construction in lengths as needed—all these make PENFLEX WELD Tubing invaluable in handling volatiles, liquids and gases with penetrative or solvent characteristics.

PENFLEX WELD corrugation serves a two-fold purpose—*gives flexibility and develops high resistance to bursting, crushing, cracking or splitting.*

Also available to maintain the leak-proof service and flexibility of PENFLEX WELD are Solseal and Metseal Couplings. Solseal, for general use, designed for service where temperatures do not exceed 250° F. . . . Metseal, a positive metal-to-metal joint, provides tight joints for higher temperature—no packing used, metal must break or melt before joint will separate.

PENFLEX WELD Corrugated Flexible All-Metal Tubing, Solseal and Metseal Couplings are described in Bulletin 90. Write for it.



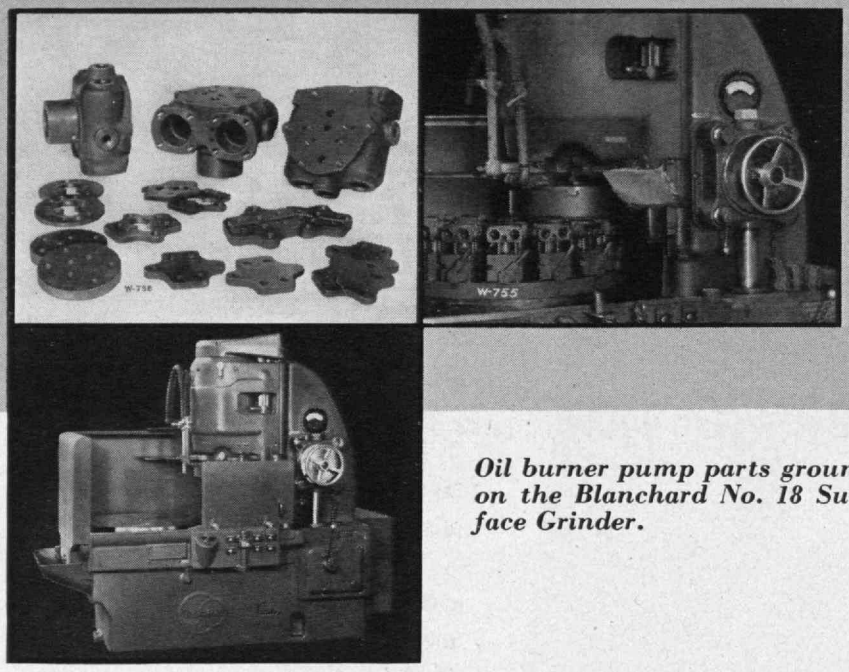
Flexible PENFLEX WELD Tubing—in sizes 5/32" to 2" I.D. . . . Bronze or Steel Construction.

PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.

7227 Powers Lane, Philadelphia, Pa.

ESTABLISHED 1902

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING



Oil burner pump parts ground on the Blanchard No. 18 Surface Grinder.

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

THE BLANCHARD NO. 18 SURFACE GRINDER is used to rough and finish grind the oil burner pump parts shown above. They are first ground from the rough, then they are normalized and ground again. All boring and drilling operations are located from the flat Blanchard ground surfaces. After machining, all parts are finish ground on the Blanchard. Twelve pump bodies are ground at once on fixtures mounted on one base plate. The base plate is held magnetically, therefore the chuck may be cleared quickly for a change of jobs. The cast iron pump bodies are 6 inches in diameter. .012″ of stock is ground off one side to limits of +.0003″ —.0001″ at a rate of 48 pieces per hour.

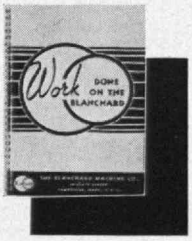
★ *Especially valuable on jobs like the one illustrated.*

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



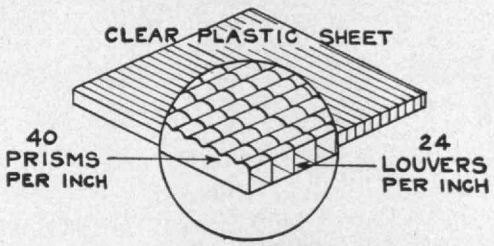
TO *Stop Glare* USE

"LOUVERPLAS"

Reg. Trade Mark

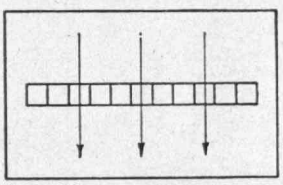
THE LOUVERED PLASTIC SHEET • CONTROL FLUORESCENT LIGHTING TO IMPROVE YOUR SEEING EFFICIENCY

NON-FRAGILE CELLULOSE ACETATE

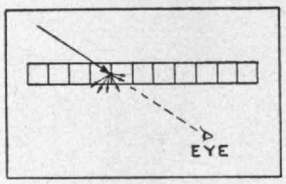


USED BY THE ARMY AND NAVY

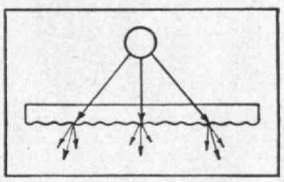
"LOUVERPLAS" GLARE ZONE SHIELDING



Sheet is composed of clear plastic alternately spaced with thin white translucent or black opaque plastic louvers. The clear plastic has high transparency for light transmission. Light is efficiently directed to the work area where it is required, not into the eyes.



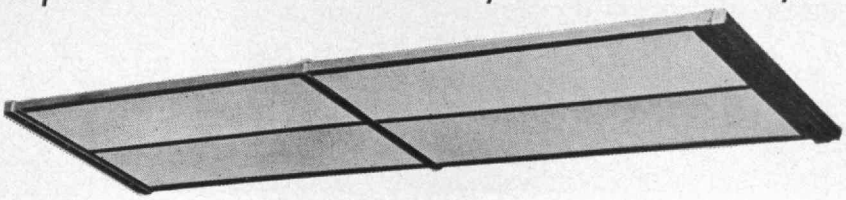
Louvers are the most effective method for the lengthwise control of the fluorescent lamp. As used in the Glare Zone Shield, the thin white translucent louvers diffuse the light within the glare zone that would otherwise enter the eyes as glare. Black opaque louvers will completely obscure the light source from vision. The degree of light control can be varied by the thickness of the sheet.



Prisms are applied to the surface of Louverplas perpendicular to the louvers. The prisms disperse the light source image and control the light in directions parallel with the clear plastic, lowering the surface brightness and eliminating glare. As used in the Glare Zone Shield, the prisms give efficient sidewise control.

Louverplas Glare Zone Covers for Industrial Reflectors

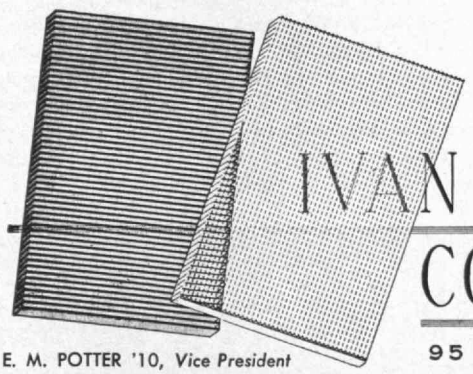
STOP EYE FATIGUE



SPEED UP PRODUCTION

Recommended Louverplas Uses

- **WHITE** — "Glare Zone Covers" for fluorescent lighting fixtures, industrial reflectors and marine fixtures.
- **BLACK** — "Vision Expediting" covers for industrial fluorescent reflectors, for close tolerance manufacturing and inspection of war materials.
- **BLACK** — "Louvered Shields" for Cathode-ray Tube devices improving visibility of sine wave.
- **BLACK or WHITE** — Many other industrial or scientific uses for light control.



E. M. POTTER '10, *Vice President*

IVAN T. JOHNSON COMPANY, INC.

95 MADISON AVE., NEW YORK

National Distributors for THE DOANE PRODUCTS CORPORATION, MERIDEN, CONNECTICUT



VULCAN

DISTILLATION
EVAPORATION ★ EXTRACTION

PROCESSES AND EQUIPMENT

THE demands placed upon chemical engineering organizations by the National Emergency are far reaching and extend into many industries. The Vulcan organization has made many important contributions to the expansion of the process industries during the past 41 years. This fact has made the wartime conversion of these industries a much easier task than would otherwise have been possible without the progressive developments offered by the Vulcan organization in the fields of Distillation, Evaporation and Extraction. Vulcan is proud of the important part which its contribution to chemical engineering is playing in American industry today.

VULCAN COPPER AND SUPPLY CO.
CINCINNATI, O., U.S.A.



Enemies Unseen . . . but for the Microscope

Bausch & Lomb microscopes, on every battlefront and at home, are helping to keep America's workers and America's fighters healthy . . . are helping to free them from the menace of invisible enemies.

Into a world otherwise invisible men with microscopes seek out the enemy that hides in the water, the soil and the air . . . help to keep fighting men in fighting trim. At home, their work protects America's industrial army which must, without fail, provide fighting tools for our fighting men.

Bausch & Lomb development of a mass production technique for the manufacture of precision optical instruments first made high quality microscopes available to all.

This same experience today is making possible the mass production of optical fire control instruments that help to make America's fighting forces the best equipped in the world.

For Bausch & Lomb Instruments essential to Victory—priorities govern delivery schedules.

BAUSCH & LOMB

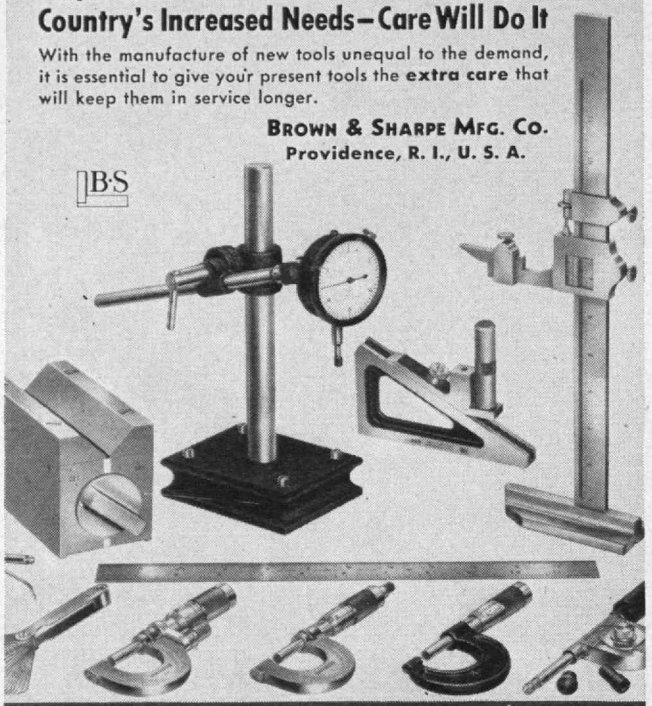
OPTICAL CO. • ROCHESTER, NEW YORK
ESTABLISHED 1853

AN AMERICAN SCIENTIFIC INSTITUTION PRODUCING OPTICAL GLASS AND INSTRUMENTS FOR MILITARY USE, EDUCATION, RESEARCH, INDUSTRY AND EYESIGHT CORRECTION

Help Extend Tool Life to Meet Your Country's Increased Needs—Care Will Do It

With the manufacture of new tools unequal to the demand, it is essential to give your present tools the **extra care** that will keep them in service longer.

BROWN & SHARPE MFG. CO.
Providence, R. I., U. S. A.



BROWN & SHARPE TOOLS

BATH
IRON WORKS
CORPORATION

Shipbuilders and
Engineers

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BATH, MAINE

THE TABULAR VIEW

Figures. — Mars as mathematician and the effect of his requirements on American higher education are surveyed on page 481 by GEORGE W. GRAY, well known to Review readers as a keen thinker and interesting writer on matters scientific. Mr. Gray's article is drawn from a chapter of his book, *Science at War*, which Harper will publish in the fall.

Arches. — From his own primary field of anatomy, M. F. ASHLEY MONTAGU of the Hahnemann Medical College and Hospital of Philadelphia brings forward (page 483) an example of natural architecture and mechanics which is of direct personal interest to human beings. His description of the ingenious construction of the human skull presents nature as an extremely skillful builder.

Exhibits. — Chairman of the Committee on the Technology Museum, ARTHUR C. WATSON demonstrates regularly through ingenious display of interesting materials in the corridors and museum areas of the Institute the practical worth of his theory of museum work stated on page 487.

Adventures. — Elihu Thomson, scholar, inventor, teacher, who from 1894 to 1937 was a member of the Institute's Department of Electrical Engineering and was twice acting president of the school between 1920 and 1923, encountered a blessing in disguise during his early education. How he used it is told (page 489) by DAVID O. WOODBURY, '21, in an article based on a chapter from his biography of the scientist, publication of which in the fall is scheduled by Whittlesey House. Author of varied volumes on topics from science and engineering, Mr. Woodbury conducts in *Collier's* a weekly department, "Your Life Tomorrow," which surveys contemporary developments in these fields.

Adaptations. — How workers in science and engineering constitute a control group in the population and must adapt to other similar groups was the theme stressed in a penetrating commencement address (page 491) to recipients of degrees from the Institute this spring, by JOHN W. M. BUNKER, Dean of the Graduate School at Technology.

Anniversary. — HEWITT G. FLETCHER, JR., '39, instructor in chemistry at Technology, is an enthusiastic student of the history of his subject and particularly of Antoine Laurent Lavoisier, whose bicentenary he discusses on page 478.

Speed with Economy

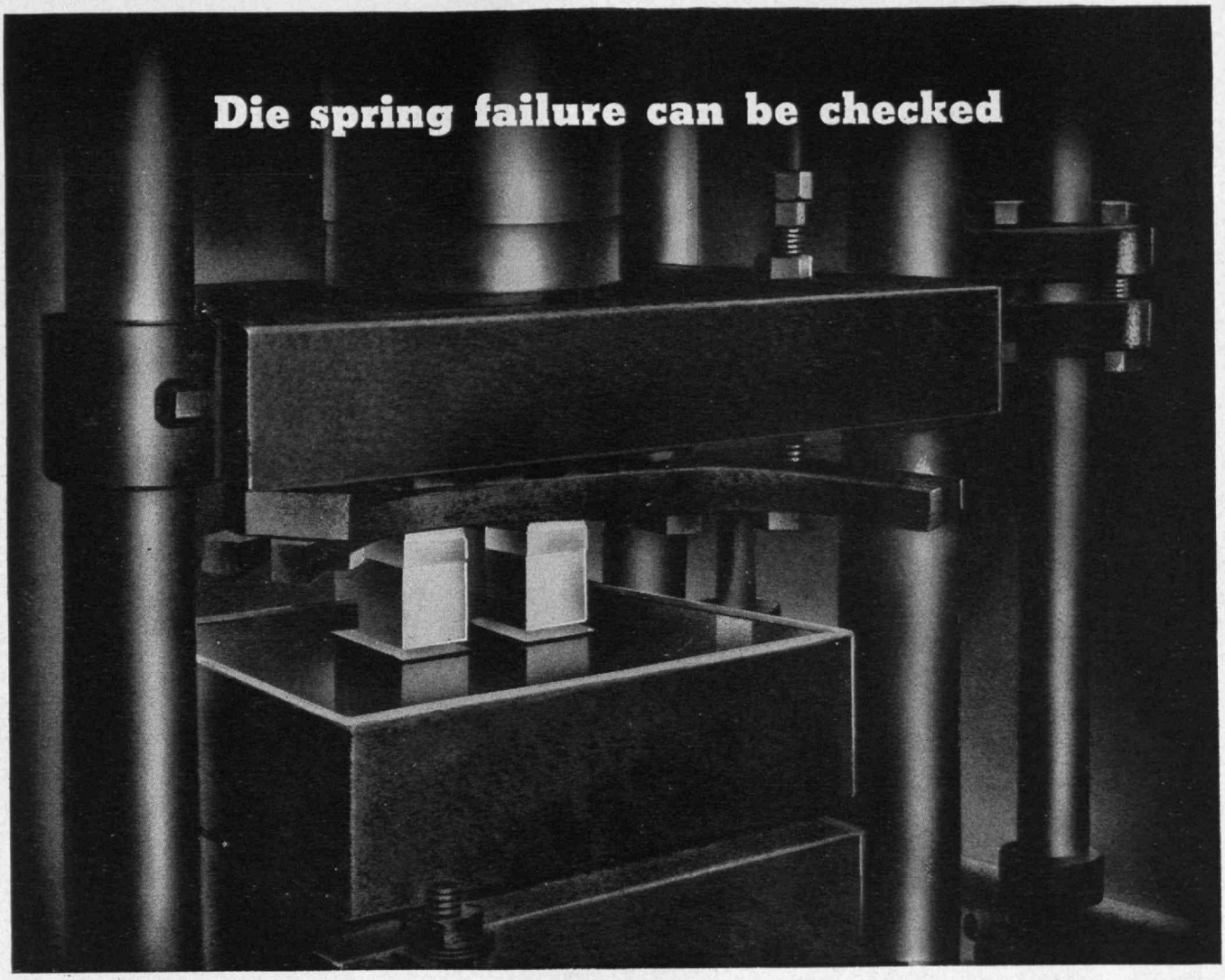


Chas. Pfizer & Co., Inc.

The broad experience we are gaining in wartime construction and the methods we have developed to overcome difficulties, will prove extremely valuable to industry after the Victory is won.

W. J. BARNEY CORPORATION
101 PARK AVENUE, NEW YORK
INDUSTRIAL CONSTRUCTION
Alfred T. Glassett, '20, Vice President

Die spring failure can be checked



Information supplied by an Industrial Publication

A recent investigation of die spring breakage developed the following prominent causes:

1. Hydrogen embrittlement resulting from plating, pickling or cleaning.
2. Incorrect die design.
3. Incorrect spring size.
4. Speed of compression cycle.
5. Poor quality of wire.

There are, fortunately, remedies for all these conditions. Hydrogen embrittlement can be corrected by heating plated springs to about 450°F. and air cooling.

Faults in die design usually consist of either insufficient or too great clearance between the outside diameter of the spring and the guide hole. The clearance should be such that the spring operates freely, but has no chance to buckle.

Care should be taken in selecting springs to see that they are properly designed for both length of compression stroke and speed of compression. If springs are repeatedly compressed too close to their solid height, quick failure will result. The same is true where the rapidity of compression is too great.

It seems obvious that the quality of the spring wire should be commensurate with the job. Cheap wire should be avoided because of defects that are bound to cause trouble, especially when springs are plated.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company

500 Fifth Avenue • New York City

MOLY

FOR Victory AND AFTER

Our research to maintain and improve the quality of Simplex insulated wires and cables, under restrictions designed to save critical materials, is getting results that mean better insulated conductors for commercial use after the war.

Simplex Wire & Cable Co.
79 Sidney Street, Cambridge, Mass.



Reg. U. S. Pat. Off.

Samson Cordage Works

Boston, Mass.

Herbert G. Pratt, '85, *Chairman of the Board*

Manufacturers of braided cords of all kinds, including sash cord, clothes line, trolley cord, signal cord, shade cord, Venetian blind cord, awning line, etc., also polished cotton twines, ladder tape for Venetian blinds, and specialties.

SAMSON SPOT CORD



Reg. U. S. Pat. Off.

Our extra quality sash cord, distinguished at a glance by our trade-mark, the colored spots. Especially well known as the most durable material for hanging windows, for which use it has been specified by architects for nearly half a century.

MAIL RETURNS

Fred Allen Remarks

For his sapient radio commentary on life, for his being a prominent alumnus of electronics, and for his once having skillfully presided at an M.I.T. alumni gathering, The Review has looked to the day when Fred Allen might write for it what he thinks about science, and so on. The letter which follows is a guidepost on that literary journey. — *Ed.*

DEAR MR. FASSETT, JR.

i haven't had time to answer your * until today. i am incessantly having to put off until tomorrow things that should be done today. (the word missing * is epistle.) i have been putting off this answer until tomorrow until today. in order to find time to permit me to beat out this document i had to reroutine my putting off until tomorrow practice. yesterday, the thing i was going to put off until tomorrow, which would have been today, i put off until the day after tomorrow. what i intended to put off today i put off until yesterday. that gave me today free to answer some mail. you can see how involved one gets when one has spent 11 years in radio.

the saturday evening post piece did mention that i would like to write. i would enjoy writing. my problem is that i have been so busy writing that i haven't had time to learn how to write. i am strictly a conjunction man. "if" i had time "and" could read "or" study i would attempt to write. "since" pantalooning keeps me too busy it doesn't look "as" "though" i shall ever get my "but" in a chair long enough to learn the rudiments of scrivening.

i remember the m.i.t. alumni gathering at mechanics building. i replaced doctor rockwell as compere on that occasion. rockwell had his thumb caught in a clam up at boothbay harbor. with his preaxial digit trapped rockwell was in no position to hitchhike down to boston. i doubt that deputizing for rockwell at that gala affair entitles me to regard myself as an alumnus of m.i.t. i took a summer course at boston university and my name is never mentioned about the b.u. corridors.

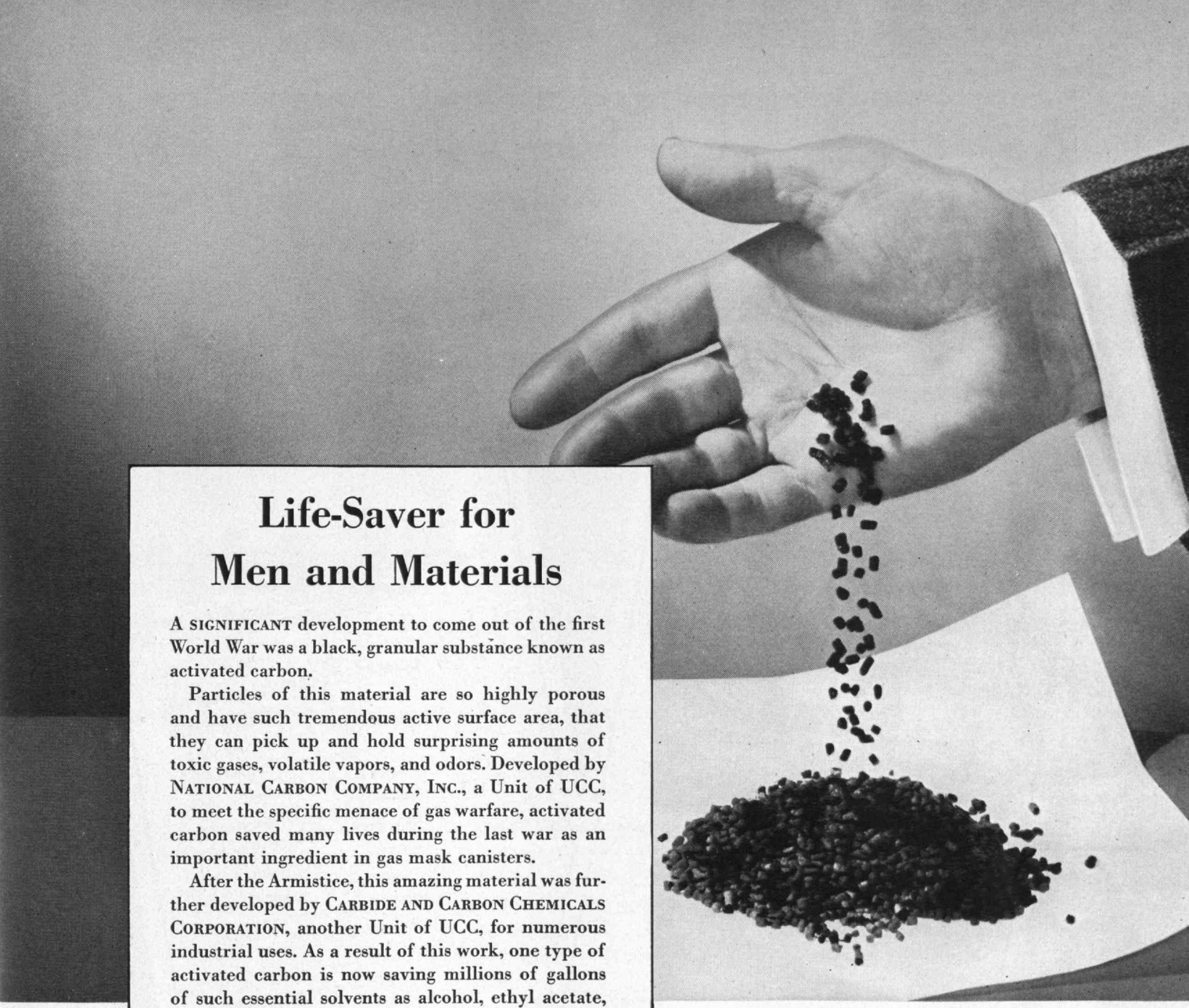
the man who invented the tube which takes advantage of the gregarious habits of electrons did me no favor. in vaudeville, my blood pressure was low, i had time to spend on correspondence or with friends, i carried some good books in my trunk and had time to read them between shows and on trains. i was leading the life of the well-known riley and didn't know it. today, as you say, i have been skyrocketed to reverse obscurity. i have essential hypertension, no time to myself, and fifty pages of dialogue to grind out every week. success, mr. fassett, is a status one person enjoys in the estimation of another person. i would rather be a buxom failure than a neurotic success. most success today is nothing but a short cut to an ulcer.

you say that i can turn my wit and satire loose on 100,000,000 a week. the top-ranking show in radio, according to the surveys, draws but thirty-odd million listeners each week. i am not the top-ranking show. my wit and satire cannot even be turned on the people who listen to me. when a comedian has written a script and has eliminated the subjects blue-penciled by the network censor, when he has made further deletions to please the sponsor, who has his own policy rulings, when he has omitted other matter to pacify the advertising agency handling the program, when he has had to ask permission to mention singing sam and finds that he cannot get permission and the joke finally turns out to be about dick tracy, when he has had to add some obvious lines to get a reaction from the studio audience so that laughter will go out over the air to prove that the comedian's material is funny, when all of these and other modifications and ramifications have been coped with each week, the radio comedian finds that he isn't shaping the thinking of millions of people. millions of people are shaping his thinking.

this will give you an uncouth idea of what the man who invented the tube which takes advantage of the gregarious habits of electrons has done for me. still you are not satisfied, mr. fassett, you want me to write something for the technology review. i know! you've got some rejection slips left over. you are trying to lead me on.

if i had an idea for a piece i haven't strength enough to kick it around.
hoping this finds you the same, etc,
i am
you are
he is.....

FRED ALLEN



Life-Saver for Men and Materials

A SIGNIFICANT development to come out of the first World War was a black, granular substance known as activated carbon.

Particles of this material are so highly porous and have such tremendous active surface area, that they can pick up and hold surprising amounts of toxic gases, volatile vapors, and odors. Developed by NATIONAL CARBON COMPANY, INC., a Unit of UCC, to meet the specific menace of gas warfare, activated carbon saved many lives during the last war as an important ingredient in gas mask canisters.

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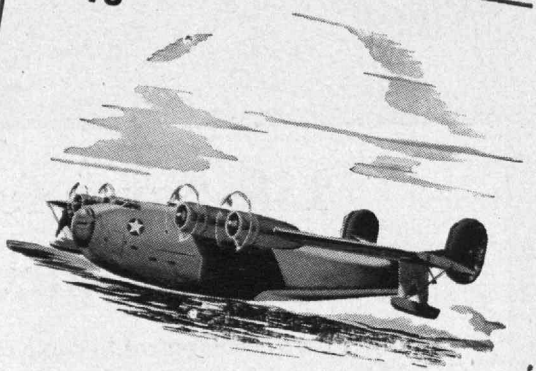
Trail Blazing in the Skies

1931



REFINEMENTS IN THE TECHNIQUE OF SPOTWELDING STRUCTURAL ALUMINUM ALLOYS were patented by Goodyear Aircraft Corporation in 1931, and used in the construction of the airships Akron and Macon – the largest aircraft structures ever built of aluminum alloy in this country. The economy, speed and durability of this process have since led to its widespread use throughout the aircraft industry.

1943



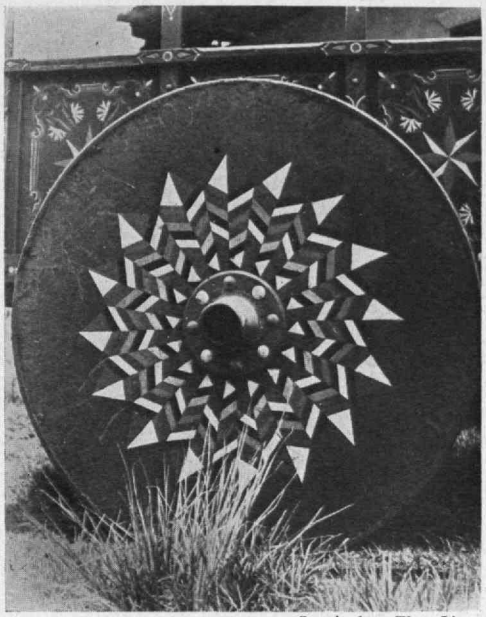
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GOODYEAR

GOODYEAR AIRCRAFT



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VOLUME 45 NUMBER 9

THE TECHNOLOGY REVIEW

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AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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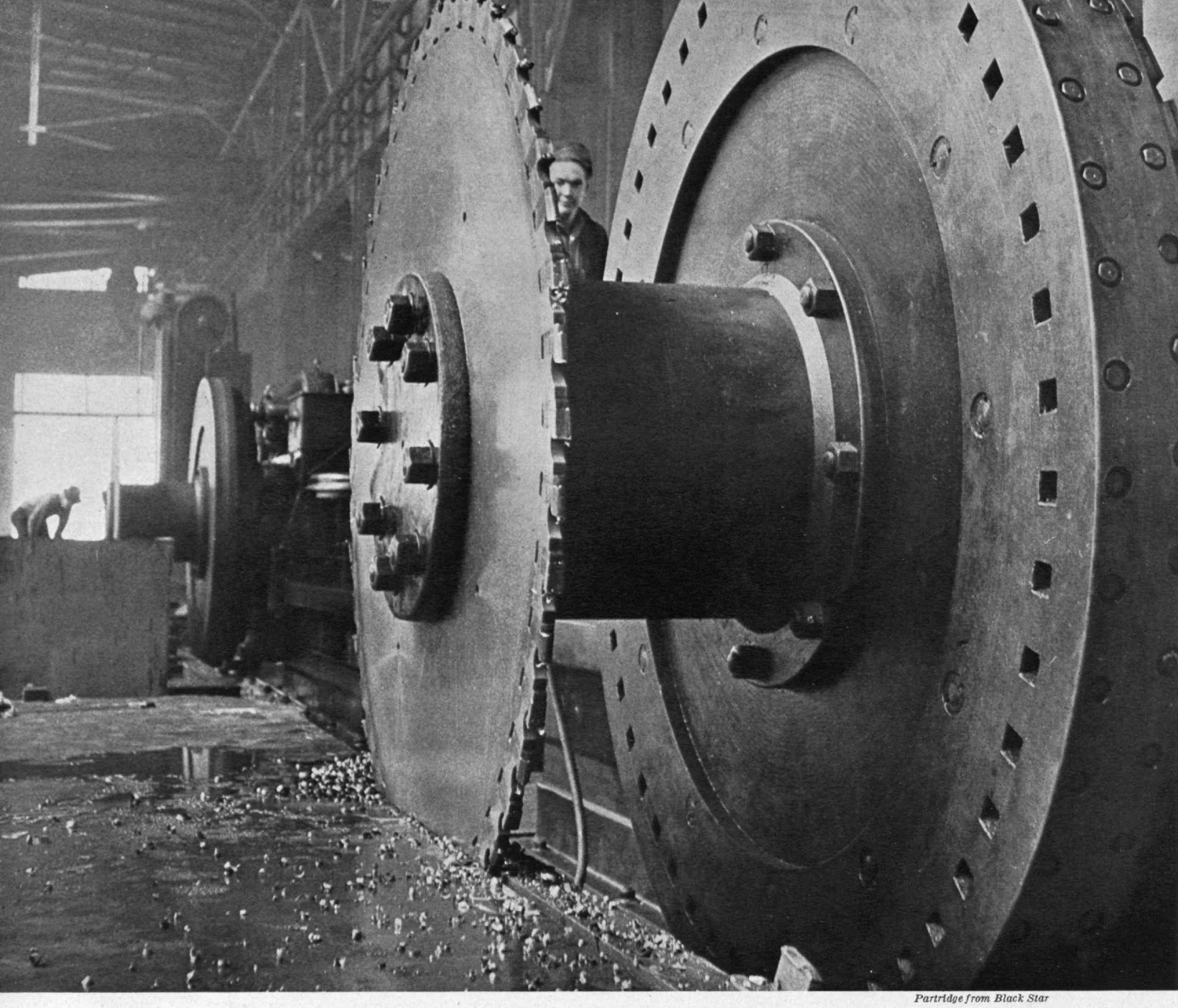
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Partridge from Black Star

A saw for Gargantua is this one slicing its way through armor plate in a naval ordnance plant.

THE
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July, 1943

The Trend of Affairs

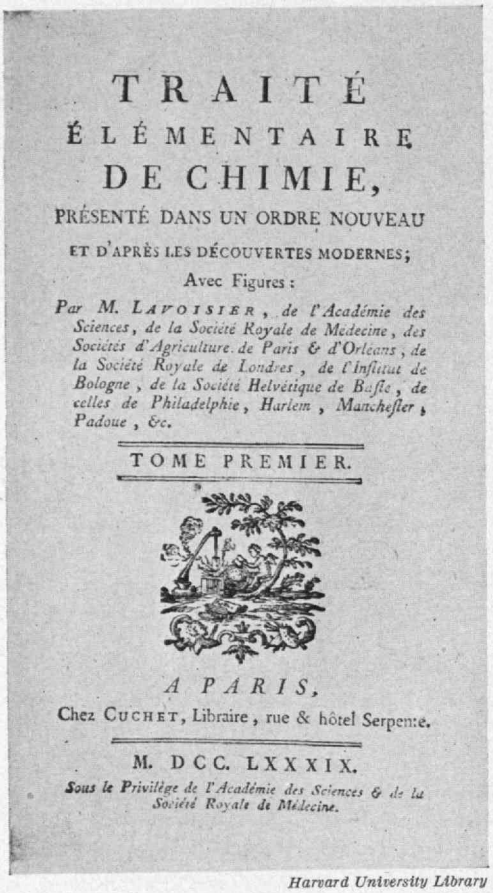
The Open Sky

A PROGRAM destined to give Pan American Airways 50 giant Clippers, each able to take scores of passengers from New York to London in 10 hours at a fare of $100, is already under way, says Juan T. Trippe, President of Pan American. In the light of accomplishments by air transport in this war and of technical advances on the horizon, nothing in this little glimpse of postwar aviation is unbelievable or even startling. What is probably worrying all air lines, here and abroad, which have international aspirations is not planes or passengers but whether permission can be obtained to fly a given route and land at a destination on foreign soil.

Unlike the sea, the skies have not yet been declared free or, in the British phrase, open. A shipping line can plan a route with confidence that it can enter and trade in any port it puts on its itinerary, except for certain regulations affecting all foreigners equally (only American ships, for example, can engage in coastal shipping along the United States). Instead of negotiating or intriguing with its own or other governments, a shipping line can devote most of its attention to the technical or economic problems associated with the route. Not that this situation was always so. When the great Portuguese explorers opened the sea route to India, they considered that the waters they traversed were as much the sovereign territory of their king as were the lands they found, and it took centuries for that concept to evaporate completely. To a large degree, the international law relating to air traffic would seem to be in as primitive a state as was sea law in the Seventeenth Century.

The reason is not hard to see. Nations have suddenly discovered that the air above them has become an important medium of transportation, and they are as loath to let go any part of their possible rights as were the older maritime powers when rich sea routes had unexpectedly fallen into their hands. The control of air routes, and particularly world air routes, would be of inestimable value in time of war. They would aid in maintaining a strong aviation industry by offering a sure market for planes and would provide training and employment for specialized personnel. Such control could also become a ready instrument for spreading national influence, culture, and trade, particularly into the many areas now difficult of access by more conventional means of transportation. As Wayne C. Taylor, Under Secretary of Commerce, recently observed: "The world, especially in the far-off places, has never had enough transportation, and it will be many, many years before anything approaching saturation can occur." Though transportation routes tend to follow trade channels already established, the reverse is also true, and it will be interesting to observe how some of the radically different routes that may result from the characteristics of the plane will affect international trade and passenger movements.

Attempting to obtain a more nearly accurate definition of "freedom of the air," the joint air transport committee of British Chambers of Commerce, the Federation of British Industries, and the London Chamber of Commerce has presented three versions of the term. According to one version, it might be restricted merely to "freedom of air passage," permitting airworthy craft of any nation to fly over any other state provided they did not land. This freedom alone could be of considerable benefit to international air lines, particularly those in Europe, where many a sovereign state can be traversed by plane in a matter of 30 minutes or so. The story is told that the air force of pre-war Belgium was frequently embarrassed by its difficulties in laying out training and test courses which would adequately extend a fast plane yet keep it within the confines of the



TRAITÉ
ÉLÉMENTAIRE
DE CHIMIE,
PRÉSENTÉ DANS UN ORDRE NOUVEAU
ET D'APRÈS LES DÉCOUVERTES MODERNES;
Avec Figures :
Par M. LAVOISIER, de l'Académie des Sciences, de la Société Royale de Médecine, des Sociétés d'Agriculture de Paris & d'Orléans, de la Société Royale de Londres, de l'Institut de Bologne, de la Société Helvétique de Bâsle, de celles de Philadelphie, Harlem, Manchester, Padoue, &c.
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Harvard University Library

Title page of the first edition of Lavoisier's epochal treatise on chemistry, publication of which at Paris in 1789 marked the formal beginning of modern chemistry

country. A broader definition might be "freedom of air facilities," meaning that registered airplanes could, without previous negotiation or notification, utilize foreign airports, weather reports, radio beams, fuel supplies, and so on, just as ships of all nations can take advantage of port and coastal facilities. Finally, the term might be made to cover "freedom of air trade," so that properly registered planes might carry passengers or freight between any two points on the globe where a profit could be gained. Conceivably a plane owned and manned by Greek nationals could then maintain a schedule between Cincinnati and Toronto without let or hindrance.

A truly open sky should greatly simplify the establishment of international air routes, for aside from the fact that such a policy would give maximum scope to the most efficient and enterprising lines, the map gives an altogether too optimistic impression of the number of alternative routes open between the various world centers. Geographically feasible routes may be impractical because they avoid large population centers or regions rich in resources, because they are unsafe, because they involve hops beyond the economic range of transport planes, or because of many other difficulties. Thus inability to obtain the use of one landing field might make it impossible for a line to maintain a coherent schedule.

Not only are natural obstacles easier to accept than political obstacles; the natural obstacles have a way of yielding to engineering progress with surprising rapidity. For example, the stretch across the northern Atlantic between the United States and Europe, though not impossible, is too long a hop to be altogether attractive to commercial planes. The Pennsylvania-Central Airlines has applied for permission to fly this route using three floating steel platforms, or seadromes, 800 miles apart. These seadromes, each containing in the order of 64,000 tons of steel and standing 70 feet above the water, would be buoyed to remain steady in the most violent sea, yet would be shifted as occasion demanded, so as to remain outside fog and ice zones.

Anent Antoine Lavoisier

BY HEWITT G. FLETCHER, JR.

THE coming August 26 marks the 200th birthday of Antoine Laurent Lavoisier — the "Lavoisier of immortal memory," founder of modern chemistry, and victim of the Reign of Terror. Next year it will be 150 years since Coffinhal of the tribunal (so tradition says) voiced his cynical blindness with the oft quoted sentence: "La République n'a pas besoin de savants, il faut que la justice suive son cours." (How the Twentieth Century mocks those unfortunate words!) Standing here as we now do before these two anniversaries, we can fairly ask: What did Lavoisier really accomplish? What is the final verdict of posterity? In the last century and a half, many opinions have been expressed on this subject, for the character of the man and his work was such as to admit doubts in the minds of some. Unfortunately Lavoisier had only just accomplished the revolution in chemistry when the maelstrom of the contemporary political revolution sucked him down and prevented him from defending the new regime which he had instituted. The majority certainly gave the man his due; their sentiments were spoken by the mathematician Lagrange, when he said to Delambre on the day following the execution: "Il ne leur a fallu qu'un moment pour faire tomber cette tête, et cent années peut-être ne suffiront pas pour en reproduire une semblable." Others were less ardent, and the cause of their diffidence touches the nature of Lavoisier's true greatness.

Lavoisier belonged in the more select of the two classes into which scientists may be ranged. One of these classes is composed of the factfinders, the fine experimentalists who prefer to tinker in the laboratory and explore simply for the joy of exploring. In matters of theory, they are either uninterested or strictly conventional. Joseph Priestley, to name one of Lavoisier's contemporaries, is perhaps the ideal example of this type. He was a delver (not in the dilettante sense), adept and contented in the laboratory but, until death, a strong and inconvertible phlogistonist. The dissenting minister was, as someone has remarked, as orthodox in his chemical doctrine as he was heterodox in his theological one.

The function of the second class of scientists complements that of the first. They may be called the theorists — men not interested in facts as such but rather in the grand scheme behind the facts. In the laboratory they are often less adept than the factfinders (thus Priestley and Scheele were far superior to Lavoisier), but their object is different; far from being curious explorers, they concentrate on a few experiments expressly designed to illuminate and correlate whole groups of phenomena. Both classes are as essential to the healthy

growth of science as explorers and homesteaders are to the proper development of a newly discovered land. It is the second of these two classes, the theorists, to which Lavoisier belonged. When one reads his papers, one is repeatedly struck by the thought that he seemed to know in advance where he was going and just what he wanted to prove. At an early stage he glimpsed, dimly, some logical structure behind the mass of recorded phenomena relating to combustion, and from then on he worked only to prove the existence of that structure — not to himself (he seemed quite convinced of it) but to others. In his most famous experiment, wherein he demonstrated that the gain in weight of tin on calcination was equal to the weight of the air consumed, he could report but two trials in which some accident, such as cracking of the retort, had not occurred, and the trials yielded only mediocre quantitative results. Yet, withal, he drew the right conclusion and went on to consolidate the theory of combustion.

How these two classes of men might nettle each other is easy to see. The laborious factfinders were (this is less true today) hardly pleased to find their dearly won facts niched in a structure developed largely in the head of a theorist. Moreover, they could not help feeling that the structure was theirs, for had they not contributed the substance of it? Such was the situation with Lavoisier and his contemporaries. Of course, Lavoisier contributed a large portion of the facts with which he brought about the revolution in chemistry, but some of the most important ones he owed to his contemporaries and these facts he sometimes took without giving proper credit to the discoverers. It was this appropriation of facts which occasioned the rancor that detracted somewhat from Lavoisier's reputation; it was in part a reflection of the ungenerosity of the age. Who can say whose was the greater contribution, Priestley's in discovering "dephlogisticated air," or Lavoisier's in recognizing the role of that substance in combustion and naming it oxygen? The capstone of Lavoisier's system also came from another. Henry Cavendish found that water is composed of "inflammable and dephlogisticated airs." Hearing of the discovery from an associate of Cavendish, Lavoisier saw the completing piece for his whole system — a piece for which he gave Cavendish little credit. A thoroughgoing theorist, Lavoisier seemed to care only for the system.

By 1789, when he was 46 years old, Lavoisier had overthrown the phlogiston theory and established modern chemistry, essentially as we know it. In that year he published his *Traité élémentaire de chimie*, the first textbook written from the point of view of the new system and marking formally the advent of it. The work is lucid and intelligible to the present-day chemist — a statement which can hardly be made of those works which preceded it. Five years later, in a basket on the scaffold in the Place de la Révolution lay the author's head, symbol of the most unthinking act of the revolution.

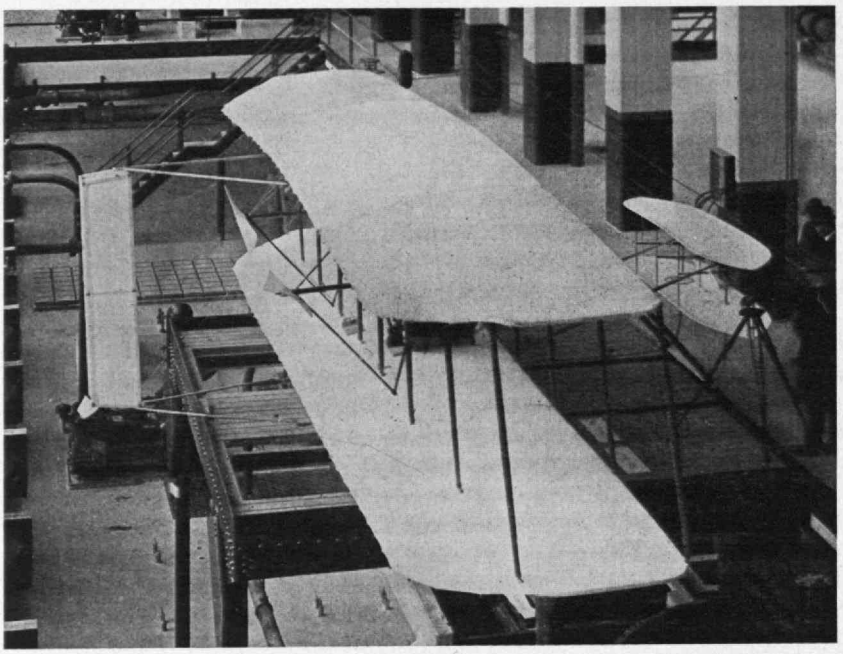
After the revolution, Lavoisier's memory was defended vigorously by his countrymen, with whom the new system became almost a nationalistic instrument. The literature about him became voluminous. Some of it, such as Hermann Kopp's account in his great *Geschichte der Chemie* (1843–1847) was scrupulously fair; other writers were critical and shortsighted. With the latter belongs Adolphe Wurtz, a French Alsatian, who began his *Histoire des doctrines chimiques* (1868) with the words, "La chimie est une science française. Elle fut constituée par Lavoisier, d'immortelle mémoire." These inflammatory sentences stirred up an acrid polemic with the chemists across the Rhine (represented chiefly by Jacob Volhard), who went as far in the opposite direction to discount the value of Lavoisier's accomplishment.

Shakespeare to the contrary, the good in Lavoisier was not buried with him; indeed, his worth seemed to draw greater appreciation from year to year as minor disputes were forgotten and the stature of the man stood revealed. The train of scholarship and appreciation really began with Edouard Grimaux, whose extensive but uncritical life of Lavoisier first appeared in 1888. This work, based directly on the many documents which Lavoisier left, is still the main source of material on his life; it fails, however, to describe his scientific contribution in detail. A first attempt at appraisal of Lavoisier as a scientist was made in 1890 by the great chemist and historian, Marcellin Berthelot, in his *La Révolution*



The Bettmann Archive

Lavoisier and his wife, from a painting by J. L. David. Born Marie Anne Pierrette Paulze in 1758 and wed to Lavoisier when she was 13, Mme. Lavoisier was of great aid to her husband in keeping records, making drawings, and translating English works for his use. Her qualities as a hostess made their home a mecca for Parisian society. Some 11 years after the execution of Lavoisier, she became the wife of Count Rumford, but their temperaments were incompatible, and the union ended in amicable separation in 1809. Her death occurred in 1836.



The famous airplane with which the Wright brothers achieved successful flight at Kitty Hawk, December 17, 1903, as it appeared when exhibited at the opening of the Institute's Cambridge buildings in 1916

chimique: Lavoisier. The Twentieth Century has seen the completion of these studies, particularly at the hands of the late A. N. Meldrum of Gujarat College, Ahmedabad, India, and Douglas McKie of London. During the last few years the work of these two men has culminated in the appearance of two biographies of Lavoisier. We are fortunate in having them on this 200th anniversary, for not only do both furnish fascinating reading but they represent, in a sense, the final verdict of history.

The first one to appear, by McKie,* is a meticulous, clear-cut, fine-grained examination of Lavoisier's chemical achievements. In the first and final chapters, it contains all the essential facts of the man's life, but these are subordinated to his works. The scientific background of his day, especially with regard to the works of his contemporaries — contributions which played so large a part in his new system — is filled in with all requisite detail, and Lavoisier's own writings, so confusing in their chronology, are analyzed with a skill which makes this book the model of what a chemical biography should be.

The second of these two biographies† is by Sidney J. French of Colgate University. It represents an attempt to deal in a balanced manner with all the aspects of the man — his activities as a man of society, financier, reformer, economist, politician, inspector of gunpowder, geologist, physiologist, and chemist. The work is written in an imaginative, popular style and describes in some detail the cultural, political, and scientific scene in which Lavoisier lived. The author takes the liberties of a novelist with the known facts of Lavoisier's lineage and furnishes a lively picture of his antecedents, without, however, obscuring the known with the fancied. Of particular interest to Americans is the connection between the Lavoisier and Du Pont families, which is here described for the first time in a biography of Lavoisier.

With these two works, chemists at last have at hand as much information about the founder of their science as physicists have about Isaac Newton.

The Wright Brothers

IN the long roll of man's inventions, the most momentous, in terms of human aspiration, is the achievement of flight. The event at Kitty Hawk on December 17, 1903, was more than the fruition of the long, persevering, and selfless research which stands to the eternal credit of the two brothers who worked so well together, and to the credit of a uniquely understanding father. The past century and a half — invention's heyday — have seen a considerable number of mechanical, electrical, and other creations brought into being through comparable efforts of consistent, hard-driving, comprehensive research. The endeavor which Orville and Wilbur Wright brought to successful culmination at Kitty Hawk 40 years ago was a distinguished example of this kind of directed exercise of the intelligence. But its greater significance lies in the fact that the 12 amazing seconds at Kitty Hawk that day were, in Orville Wright's words, "the first in the history of the world in which a machine carrying a man had raised itself by its own power into the air in full flight, had sailed forward without reduction of speed, and had finally landed at a point as high as that from which it started." The most ancient of man's conscious aspirations, charged with many kinds of historical and spiritual values, had reached its consummation in that dramatic fact.

Fred C. Kelly's biography of the Wright brothers‡ is not the definitive history of that achievement. To say so is not in the least to disparage Mr. Kelly as a reporter; it is rather merely to recognize the great difficulties under which any historian must labor whose task is to treat of world-shaking events before time has allowed the whirlwinds to subside. Objective, factual, and detailed, Mr. Kelly's book is an extremely valuable assemblage of the elements in the drama, and on this count its value is enhanced by the fact that the author had in his work the interest and support of Orville Wright, who read the manuscript and verified the accuracy of statements.

Two portions of the story as Mr. Kelly tells it are particularly to be noted. The one is explicit: his good-humored but unsparing survey of how the fourth estate in 1903 shrugged a skeptical shoulder at the biggest story of the year. Harried (*Continued on page 510*)

* *Antoine Lavoisier; the Father of Modern Chemistry.* Philadelphia: J. B. Lippincott Company, 1936.

† *Torch and Crucible; the Life and Death of Antoine Lavoisier.* Princeton: Princeton University Press, 1941.

‡ *The Wright Brothers; a Biography Authorized by Orville Wright.* New York: Harcourt, Brace and Company, Inc., 1943. 340 pages. $3.50.

The Next Decimal Place

War's Reliance upon Mathematics Spurs a Renaissance in Mathematical Studies, Emphasizing Applications

By George W. Gray

ONE day in 1941, according to a story out of England, a nazi shell from across the Channel hit near Dover and killed several civilians out of a crowd gathered to watch a tennis game. Before it reached the ground, the projectile passed through a zone of foliage, snapping off the branches of several trees and underbrush. As the story goes, two British mathematicians measured the angle of path indicated by the snapped branches, from this they calculated the trajectory of the missile, and thereby they worked out the probable position of the gun on the French Coast. Then a Royal Air Force plane went across and dropped bombs on the indicated spot, and thereafter the gun was silent.

The major contribution of mathematics in this incident was not the service of determining the path of the shell back to its source. That was a fairly routine problem in ballistics. A greater achievement was that represented by the design of an airplane able to rise from the ground with a heavy bomb load, fly a given course with sureness and dispatch, and from miles up lay its deadly parcels on a dot on the map. There is of course an element of luck in every hit, but the performance of the plane and of the bombardier is to be credited to mathematics no less than it is to the gasoline which propelled the plane or to the high explosive which powered the bomb.

For all these weapons which we have called gifts of physics are equally gifts of mathematics. If mathematics is queen of the sciences, as Gauss declared more than a century ago, perhaps physics may be called king. Archimedes, Newton, Gauss himself, Clerk-Maxwell, Einstein, and many other creative scientists exemplify in their work the fruitful collaboration of mathematics and physics. Their equations not only guided and tested their physical discoveries but also in many instances gave the first clue, the spark which was fanned into flame by experiment. Though many important inventions have been stumbled upon or were first crudely conceived by experimenters ignorant and in some cases contemptuous of the mathematical techniques, rarely has an invention been brought to full utility without the application of mathematical analysis to the problems involved in the design of it. This condition is particularly true of the complicated high-speed machines of today, including those on which we rely for victory in warfare.

The branches of physics which have borne the brunt of the struggle — ballistics, aerodynamics, optics, acoustics, and electronics — have derived much of their improved facility and accuracy from men working with paper and pencil to increase the approximation of perfect design to the next decimal place. Their work, in turn, rests on the heritage of observations, theorems, demonstrations, and techniques which have come down through the centuries.

It is the progressive mechanization of war which makes the need for mathematics and mathematicians so insistent. As weapons become more speedy in operation and more forceful in the blows they deliver, standards of precision in the construction of them and standards of accuracy in their performance become ever more exacting. A minor departure in aircraft shape which makes no serious difference in a plane moving at 200 miles an hour may add a prohibitive drag when the plane moves at 400 miles an hour. As the velocity and altitude of flight increase, the speed of operation of antiaircraft defense must be increased still more. This factor means cartridges built to specifications measured in ten-thousandths of an inch instead of mere thousandths, shells streamlined for the minimum of air resistance, and time fuses correct to the four-hundredth part of a second. Many of these devices must be made and assembled in air-conditioned factories because dust and temperature changes are silent saboteurs of the new instrumentation. Narrow margins of error may be decisive between defeat and victory — and the determination and control of these slight differences lie within the scope of applied mathematics. Old easygoing methods of cut and try not only are wasteful of time, labor, and materials, all so precious in war, but may miss the goal altogether.

Aircraft may attain a particular speed at which the wings will vibrate in a violent and self-destructive manner known as "flutter." One of the problems of design is to make sure that the highest speed at which the plane can be flown is less than this critical flutter speed. To investigate this question one may build a specimen plane or a small-scale model and test it in a wind tunnel. Or the specimen plane may be tried out in the air by a test pilot. But both methods require labor and material, to say nothing of time, and such flight testing is very dangerous. Nor are these experimental procedures possible in the initial stages of the design of a plane. By means of applied mathematics, however, one can predict the critical speed at which a wing of a given type, shape, and size would develop flutter. Moreover, through the use of the results of mathematical analysis, favorable departures in design can be discovered and theoretically explored with the plane still in the blueprint stage.

After a design has thus been worked out, a model may be built for testing in a wind tunnel — and here again mathematics becomes an indispensable tool. For suppose the model is one-fourth, one-third, or one-half the full size — how can one determine from the performance of the model what the performance of the full-sized plane

will be? Aerodynamics has many variables, and its physical laws require mathematical formulation to enable the aeronautical engineer to infer the actual flight performance from the wind-tunnel performance of a small-scale model.

Many of the complicated mechanisms, instruments, control devices, and auxiliary equipment which are necessary for the proper functioning of the aerial warship are subjects for applied mathematics. An example is the gyroscope, which operates in the automatic pilot, the compass, turn indicator, and other devices. The employment of it in such equipment can be understood and engineered only by persons familiar with that branch of applied mathematics known as dynamics.

Another important branch of applied mathematics is the theory of elasticity, which embraces our fundamental knowledge of the stretch of materials under load. Those who design artillery, tanks, warships, airplanes, and armor plate rely indirectly on the mathematician for formulas which will enable them to predict the behavior of materials from tests made on specimens.

Electrical circuits and electronics are territory for the mathematician. Without his aid the highly complicated devices of military communication, aircraft and ship detection, and gunfire control would be far more limited than at present. Several of the advances in telephone communication were mathematical inventions: The single side-band system of carrier transmission, for example, which doubled the number of long-distance calls that could be handled over one line, was the outcome of a single trigonometric equation. The design of electric filters and equalizers also was born of mathematics. "Mathematics," declared an authority of the Bell Telephone Laboratories, "has been as essential to the development of nation-wide telephony as copper wire or carbon microphones."

One fascinating field of mathematics which finds important application in war is the theory of probability and of mathematical statistics. The applications of probability to artillery fire are classical; but in the present conflict the emphasis on bombing, on submarine hunting, on antiaircraft destruction of airplanes, and on battles in the air all give rise to a great variety of important problems in which the laws of chance play a vital role. Some of these problems are highly complicated and involve so many factors that the actual computation of results requires weeks or months, even when the most powerful modern computing machines are used. In a war of the present type, one can trace a very real connection between the success of the superb Russian offensive and the fact that a Stalin Prize is given for a paper entitled, "On Dispersion, Probability of Hits and Mathematical Expectation of the Number of Hits."

The varied mathematical resources which have been suggested thus far are all comparatively recent arrivals on the American scene. When the American Mathematical Society was organized in 1888, it could muster only six members. Not until after the turn of the century did a few universities begin to acquire men of high professional rank in this science, and their tendency was to magnify the theoretical aspects to the neglect of practical applications. Harvard developed an exceptional group for research and teaching, to be followed by a similar development at the University of Chicago and then, about a dozen years ago, by the establishment of the Institute for Advanced Study at Princeton. These three centers have become fountainheads of mathematical study and by the 1930's had attained a position of world leadership in pure mathematics. In addition to these three powerful faculties, a dozen other American universities had departments strong both in teaching and in research, but with rare exceptions they exalted the theoretical.

The layman might suppose that if a person knows mathematics, he ought to be able to apply it to any problem subject to mathematical treatment — but the situation isn't so simple. Professor S. R. Williams of Amherst tells of an engineer in a large industrial research laboratory who confessed his inability to cope with certain problems despite the fact that he had been trained in the calculus, vector analysis, elliptic integrals, complex variables, and modern theories of differential equations. "The trouble, as he saw it, was that the courses were given by mathematical instructors who placed too much emphasis on manipulations and neglected or ignored the applications to practical problems." This engineer appealed for help to four different professors of mathematics. Three of them failed to provide the needed solution, but the fourth man, who was able to see the correspondence between a physical situation and its mathematical form, succeeded.

In 1938, the National Research Council was asked by the National Resources Planning Board to make a survey of scientific, industrial, and business research in the United States. One of the subjects up for consideration was the resources of mathematics for industrial research, and for this the council turned to Thornton C. Fry, mathematical research director for the Bell Telephone Laboratories. His resulting report, "Industrial Mathematics," provided a critical review of the entire field. In it the author discussed the many uses of and needs for mathematics in industrial research in contrast with the fewness of fully trained industrial mathematicians. "Though the United States holds a position of outstanding leadership in pure mathematics, there is no school which provides an adequate mathematical training for the student who wishes to use the subject in the field of industrial applications rather than to cultivate it as an end in itself," said Dr. Fry. "Both science generally, and its industrial applications in particular, would be advanced if a group of suitable teachers were brought together in an institution where there was also a strong interest in the basic sciences and in engineering."

Not all have entirely agreed with these statements. Some disagree with the extent to which Dr. Fry identified "applied mathematics" and "industrial mathematics." Others think he was too pessimistic about the state of applied mathematics in this country in 1940, the year the report was published. But the timely challenge presented by his article, combined with the developing necessities of the war, is surely resulting in a great change of emphasis. A recent President of the American Mathematical Society, himself a pure mathematician of great distinction, has argued for a "renaissance of applied mathematics" and has (*Continued on page 496*)

The Skillful Skull

Man's Brain Case, in Its Ability to Resist and Dissipate Manifold Stresses, Is a Noteworthy Example of Efficient Architecture

By M. F. Ashley Montagu

THE human skull is not often thought of in architectural terms, yet it probably represents one of the most perfect examples of a structurally efficient piece of architecture ever developed. If, for convenience, we may speak teleologically, it may be said that the purpose of the skull is to afford support and protection for the brain and for most of the organs of sense. Such a bony structure must be able to resist stresses and strains of all sorts and must be so constructed as to enable the forces acting upon it to be innocuously distributed. The skull fulfills all these requirements perfectly.

The only movable portion of the adult skull is the lower jaw. Normally, it is entirely through the action of the lower jaw upon the upper jaw that stresses are produced upon the skull as a whole. Since every movement of the lower jaw which brings its teeth into contact with those of the upper jaw produces a series of more or less powerful stresses that may affect the whole skull, the latter must be perfectly adapted to receive the thousands of assaults which are every day made upon it.

Not alone through the teeth does the lower jaw act upon the skull but also through the agency of the powerful temporal muscles, which are attached to the upper side walls of the skull and extend from the temple to a little distance above and behind the earhole. When the mouth is opened, the muscles exert a pull upon the skull; when the mouth is closed, they exert a compressive force. In addition, there are the masseter muscles, which arise from the arch of the cheekbone (the zygomatic arch); and the pterygoid muscles, which arise from the pterygoid pillars on the base of the skull. All these muscles pull and push upon the bony structures to which they are attached. Supported and moved in all directions by these muscles, the lower jaw (or mandible) is freely hinged by a capsular group of ligaments to a more or less shallow depression, the mandibular fossa, into which the head (or condyle) of the mandible is received immediately in front of the earhole. The reader, by opening and closing his lower jaw and by moving it from side to side, will be able to confirm for himself how freely movable is the head of the mandible and how great, in consequence, must be the variety of forces which act upon the skull. In front of the head of the mandible is a shallow notch, which terminates in front in an inverted pyramid of bone, the coronoid process.

Separated by the mandibular notch, therefore, are two processes surmounting the perpendicular portion, or ramus, of the lower jaw: the coronoid in front and the condyloid, or head of the mandible, behind. The powerful temporal muscles are attached to the coronoid process and to the front border of the ramus of the lower jaw. The mandible thus is a lever, with its fulcrum corresponding to the condyle at the mandibular joint — that is, the joint formed by the head of the lower jaw together with the mandibular fossa in the temporal bone on the base of the skull. The force is exerted through the coronoid process and along the front border of the ramus of the lower jaw, while the resistance is distributed along the upper border of the tooth-bearing, or alveolar, portion of the body of the mandible, in which are lodged the roots of the teeth. The relationship among all these structures — the teeth, the tooth-bearing body, and the coronoid process — though commonly overlooked, is one of the most intimate nature.

Observing the kind of structural changes that occur when some of the normal relationships among these structures are disturbed brings into high relief the distribution of the moments of force of normal stress and strain. An opportunity of observing how the abnormal may throw light upon the nature of the normal is also thus afforded.

Normally, when the lower jaw is closed upon the upper jaw, or maxilla, the first structures to meet are the first molar teeth of the upper and lower jaws, followed by the second molars and the first and second premolars, and finally by the third molars and the incisor teeth. The peculiarity of this series of contacts is due to the fact that the occlusal, or biting, surfaces of the teeth — reflecting the conditions of the tooth-

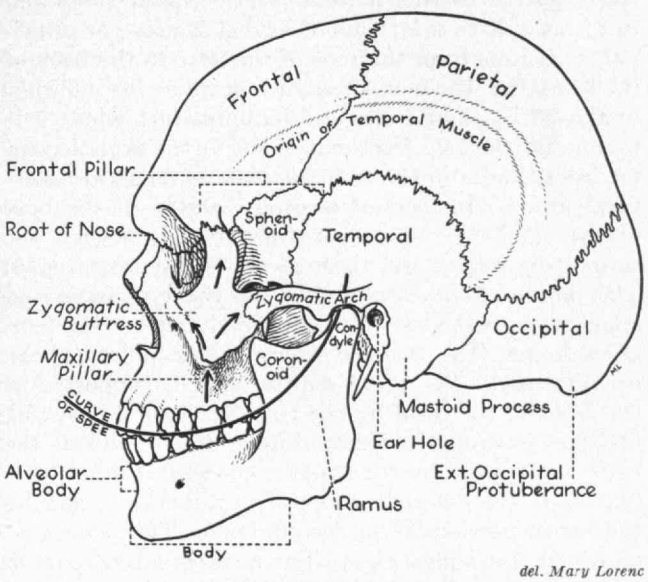


Fig. 1. The left side of the skull

bearing portion of the jaws — are arranged upon a curve, the so-called curve of Spee, which approximately corresponds to the arc of a circle drawn tangential to the outer cusps of the teeth. In the female this curve more nearly approximates the arc of a circle than it does in the male; hence the somewhat more "pert" appearance of the front of the upper jaw and its teeth in the female than in the male. If this curve is prolonged backward, it normally passes through the front border of the condyle of the lower jaw when the latter is at rest (Fig. 1). Thus the arrangement of the teeth is continuous with the path of the condyle or concentric with it, so that both can move around the same fulcrum.

Since the biting surfaces of the teeth do not present plane surfaces but are broken up into elevated cusps and depressions — the cusps of the lower teeth fitting into the depressions of the corresponding teeth in the upper jaw and vice versa — an efficient method of enabling the teeth to move upon one another would be to arrange them on both sides of the arc of a curve, on much the same principle as the cogwheel works. Far more efficient than the cogwheel, however, is the existing arrangement, for the curve of Spee allows the teeth to move upon each other in a great many directions. The lowest point of the curve of Spee is situated at approximately the middle of the first upper molar tooth. This, interestingly enough, is the second permanent tooth to erupt (at 6.4 years in boys, 6.1 years in girls), the first permanent tooth being the first molar of the lower jaw, the so-called six-year molar (acquired at 6.3 years in boys, 5.9 years in girls).

The first upper molar is subject to the greatest amount of stress and strain and, incidentally, it is this tooth which is generally the first to become diseased and the one which is the earliest and most commonly extracted. The arrangements for distributing the forces acting through this tooth may now be described.

Architecturally the skull more closely approaches the Gothic style than any other, for the skull is best regarded as an arch or series of arches, the pillars of which are supported and reinforced by a number of buttresses. The three main arches are formed respectively by the frontal, parietal, and occipital bones and run from side to side; while the great sagittal, or principal, arch runs from the root of the nose to the back of the head, the whole on a foundation which is somewhat weakened by the fissures and foramina into which it is broken up (Fig. 2). Fortunately for us the skull accommodates shocks in the same manner as do all architectural arches: Instead of passing directly to the base of the skull, the shocks are distributed through the supporting pillars and through the various buttresses. The pillars of the frontal arch are the zygomatic and sphenoid bones. Those of the parietal arch are the temporal bones. The mastoid processes are pillars of the occipital arch. The great sagittal arch is supported at the front of the head by the glabella — the thickening of bone between the supraorbital ridges — and at the back of the skull by the massive concentration of bone known as the external occipital protuberance, and by the basilar portions of the occipital bone. The pillars generally are flat bones, except for the most lateral part of the zygomatic pillar, which is relatively robust.

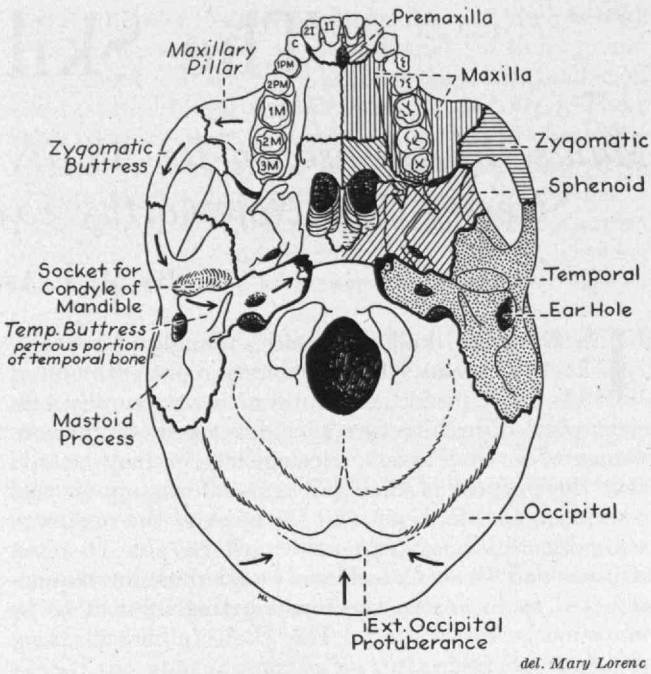


Fig. 2. The base of the skull

The key buttress of the whole skull is the quadrangular zygomatic bone, which lies against the frontal bone above, the upper jaw below, the sphenoid bone medially, and the zygomatic process of the temporal bone. These relations are displayed in Fig. 1. The important fact to observe is that the lower part of the zygomatic buttress lies in a significant relation to the upper jaw and to the first upper molar tooth. It will at once be seen that a pillar of bone derived from the upper jaw rises at a little distance above the first molar to join the zygomatic buttress. Through this maxillary pillar practically all the stresses arising in the upper first molar are transmitted. From this pillar, the stresses pass into the zygomatic buttress, where they are then distributed in all directions as illustrated in Figs. 1 and 2. In this way the forces are distributed throughout the skull without any injury to it or discomfort to the organism.

The structure of the bones themselves facilitates the accommodation of these forces since the bones are made up of two layers of dense bone between which is a layer of cancellous bone of spongy, or latticelike, structure (see Fig. 3). Thus forces traveling in the direction

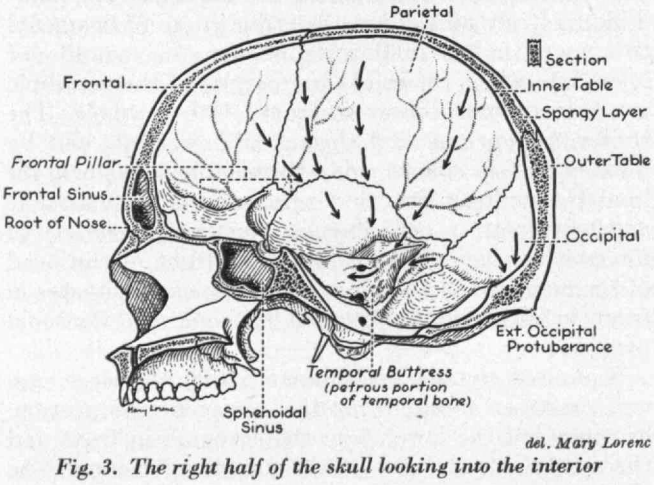
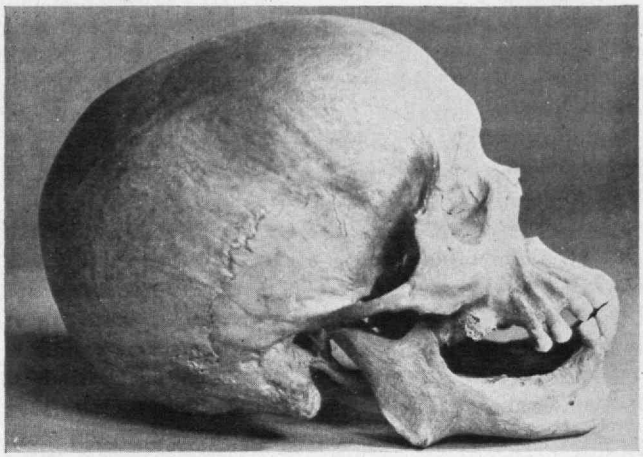
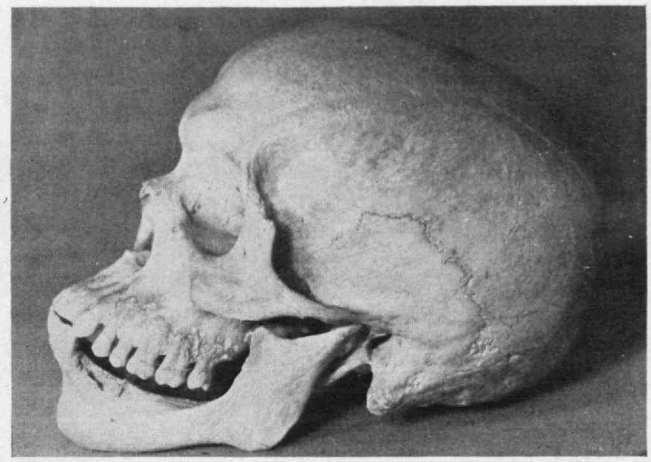


Fig. 3. The right half of the skull looking into the interior





Left: *Fig. 4. Right side of the skull of an American Negro, showing the loss of three molar teeth in the upper jaw and all the molar and premolar teeth in the lower jaw, together with the remarkable protrusion of the upper jaw. Evidences of an abscessed condition may be seen at the back of the upper jaw.* Right: *Fig. 5. The left side of the skull shown in Fig. 4. Here all the premolar and molar teeth of the lower jaw have been lost, and evidence of an abscess is seen in the premolar region of the lower jaw. Note how the upper teeth, meeting with no resistance from below, have migrated downward. Note also the shallowness of the notch at the top of the ramus of the jaw. Compare the angle made by the ramus and the body of the lower jaw with the same angle in Fig. 1.*

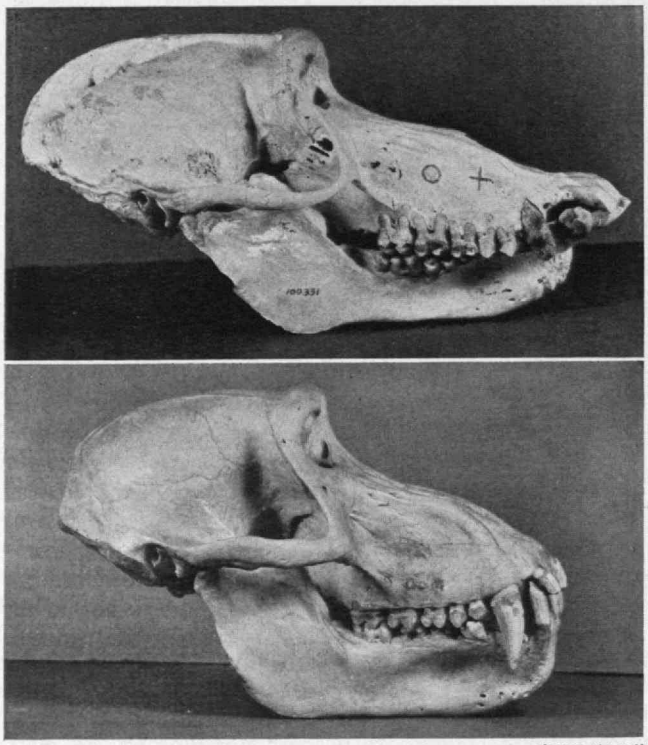
of the long axes of the bones will be greatly reduced by the dense layers of bone and will have a considerable amount of their energy dissipated by being sidetracked into the innumerable struts forming the spongy layer. Forces acting at right angles to the long axes of the bones will be diffused through the outer dense table and, if the forces are still powerful enough to reach the spongy layer, will be greatly reduced there, so that they would have to be powerful indeed to reach the inner table of the skull. The zigzagging latticework of the spongy layer very appreciably serves to take up and dissipate the tensive and compressive forces set up by the temporal muscles as they pull and press upon the side walls of the skull during opening and closing of the lower jaw.

What happens when some of the normal relationships of the structures of the skull are in any way disturbed is well illustrated in Figs. 4 and 5. Here we see photographic views of the right and left sides of the skull of an American Negro of mixed origin, about 45 years of age. It will be observed that the front of the upper jaw as well as the incisor teeth which it bears projects forward most abnormally. This projection exceeds by about 20 degrees that which normally occurs in the mixed Negro! This is a considerable deviation from the normal. Some years before his death, this individual had lost most of his molar and premolar teeth as a result of bad abscesses; in consequence, all the forces brought to bear upon the upper jaw were limited to the incisor teeth against which the lower incisors occluded. The constant pressure exerted against these teeth gradually forced the upper jaw and teeth upward and forward, while the angle between the ramus and the horizontal portion, or body, of the lower jaw enlarged so that the body and the lower teeth were projected forward. Instead of the upper teeth biting *over* the lower, an edge-to-edge bite was produced. Thus the lower jaw, superficially not appearing to have done so, suffered even more than the upper.

These are striking enough changes, but observe what has happened to the rest of the jaws and teeth: The two right upper premolars, not having any antagonists against which to bite, have grown downward as far as they could (Fig. 4). Similarly, all the upper teeth on the left side (Fig. 5) have descended way below their normal level. The tooth-bearing portions of the jaws from which the teeth have been lost have shrunk considerably. The maxillary pillar has disappeared; the coronoid process, the mandibular notch, and the width of the sidepiece, or ramus, of the lower jaw are much reduced; and the angle between the relatively perpendicular ramus and the horizontal portion, or body, of the lower jaw is greatly enlarged. The marked asymmetry of the vault of the skull may or may not have been produced by the same conditions.

This example serves to illustrate several important facts: Firstly, it is clear that the principal purpose of the tooth-bearing portions of the jaws is to give support to the teeth; and that when a tooth is lost, the alveolar portion of the jaw in which the tooth was lodged undergoes atrophy. Secondly, a tooth is not properly regarded as merely a biting organ, for it is an organ which is structurally and functionally interrelated with several others, so that any significant variations in it may be, and usually are, reflected in the adjacent structures. Thirdly, the form of the jaws may be considerably modified by changes in the distribution of stresses produced by the lower jaw after loss of certain teeth.

Facts such as these should teach us to look upon the loss of even a single tooth as a disaster to be avoided. The shrunken appearance of the jaws and the consequent accenting of the chin of old people who have lost their teeth are familiar to everyone. The Punchlike chin is explained by the fact that whereas the tooth-bearing portions of the jaw disappear, the base of the jaw remains unaltered; hence while the lips move inward, the chin stays put. George Washington, for instance, was practically toothless in his last years. Those acquainted with this fact may well be somewhat puzzled by portraits painted by Stuart and Peale, in which Washington's upper and lower jaws seem rather full at the lips. Of course, Washington wore an ivory denture, but that is not the explanation. The true explanation is simply



Martin Huyett

Above: *Fig. 6. Right side of the skull of a baboon* (Papio hamadryas) *suffering from rickets.* Below: *Fig. 7. Right side of the skull of a normal baboon of about the same age and species as that shown in Fig. 6 above.*

this: For the purposes of the portraits, and presumably posterity, cotton wool was stuffed under his lips in order to fill out his jaws! Modern restorative dentistry would have rendered such an artifice quite unnecessary.

Now let us reverse the conditions and observe what happens when the supporting structures of the teeth — the bone, the pillars, and the buttresses — break down. First, however, it will be necessary to discuss the structure of normal bone.

Bone is composed of white fibrous tissue impregnated with mineral salts. The mixture is so perfect that the size and shape of the bone remain unaltered when all the fibrous tissue is burned out of it or when all the salts are dissolved out of it by acid. The salts make up approximately 70 per cent of the weight of the bone, and about six-sevenths of that is calcium phosphate.

When a thin slice of bone is examined through the microscope, it is seen to be made up of multitudes of thin sheets closely applied to one another. These layers are called "lamellae." Among them may be seen a number of large holes, the Haversian canals. Beside them are to be seen several minute spaces between each two lamellae; from these lacunae run a number of fine canaliculi, which pass between and through the lamellae and connect each lacuna with its neighbors. During life, each lacuna is completely filled by a bone cell, or bone corpuscle; the latter is essential for the nutrition and life of the bone.

A large proportion of the bone lamellae are tubular and are arranged in groups of from 4 to 20 tubes placed concentrically, one outside the other. Each group is called a "Haversian system," and the tubes are called "Haversian lamellae"; the larger holes seen in section are the cavities of the central tubes of the systems, and each of the holes is called a "Haversian canal." In addition to the Haversian lamellae, there are two other kinds of lamellae: interstitial lamellae, which are set between the Haversian systems, and circumferential lamellae, which are at the surface of the bone and are laid down under the periosteum, one after the other, in widening circles. On the outside of the bone is the periosteum, a tough fibrous membrane which is the active agent in the making of bone while the bone is growing or being repaired. Bundles of fibers from the periosteum pierce the circumferential lamellae and are called "perforating fibers." Becoming calcified, they nail the lamellae together.

During life, these elements of the bony structure are in constant process of being renewed, a process that depends primarily upon the proper nutrition of the organism. The best-known example of the effects of malnutrition upon developing bone is the disease of rickets, during which the whole structure of the bone breaks down and the bone itself becomes soft. Being no longer capable of resisting the strains put upon them by the muscles, the bones become seriously deformed.

In Fig. 6 is seen the skull of a hamadryas baboon (*Papio hamadryas*) which, after having reached a healthy adulthood, developed the adult form of rickets (rachitic osteomalacia) following transfer to a zoological garden where it probably suffered from lack of sunlight as well as from lack of the foods to which it had been accustomed during its life in the wild. For comparison with this animal's skull, Fig. 7 shows another of the same age and species, but perfectly normal. In the skull of the diseased animal, the front teeth and the body of the upper jaw supporting them have been almost completely flattened out, the tusklike canines are splayed out laterally, and the molar teeth are bent at their roots and everted, so that the biting surfaces of the teeth point somewhat laterally.

Rarefaction of the bone in the ramus of the lower jaw has proceeded most in the portion below the condyle, where the bone is as thin as India paper. The condyles have undergone such changes as to give the impression of having "melted." Throughout the skull, the bone has become exceedingly thin and fragile. The rarefaction of the bone is due to the extreme absorption of salts, while the great weakening of the bone is clearly due to the breakdown of the Haversian systems and their associated structures. These conditions are strikingly reflected in the tooth-bearing portions of both jaws which, since they are no longer structurally able to resist the stresses transmitted to them through the teeth, have given way, together with the teeth borne by them, to the limits of the forces operating upon them.

When, in disease, the supporting structures give way, the structures supported do likewise. When supported structures give way, the supporting structures become disordered because their order is dependent upon an interrelated system of elements from which one cannot be altered or removed without altering or disturbing all the others. Thus, from the smallest elements to the largest the architectural system presented by the skull is a thoroughly interdependent one. Since the construction of the skull combines the (*Concluded on page 496*)

Barnum Began It

A Postwar Philosophy for Museums, Foreseeing Great Opportunities, Calls for Compromise with His Techniques

By Arthur C. Watson

IT is relieving these days to think occasionally of the law of compensation, to reaffirm our belief that the end of the present catastrophe will bring a mode of normal living seemingly more pleasant than ever before. The word "postwar" has borrowed the paradisaic meaning of oasis, so nourishing to the mirage-beset man in the desert; it is the kirk, the ivy tod, in the vision of the sea-worn mariner. Though economic readjustment is perhaps the most vital phase of postwar planning, yet cultural rehabilitation, the development of a new orientation, deserves serious thought, and the museum man need not be at all modest about the part he can play in it.

The preparedness of the museum man to meet the changes that will follow the war will be discussed here. The subject is of general interest because of the rapid progress in the ability of the museum to get under people's skin. Indeed, this ability developed so fast in the years preceding the war that the modern museum may be considered almost as a new factor in our culture. Is it too rash to prognosticate that this factor will reach its fulfillment with the coming of peace?

The "modernity" of the modern museum was begotten by a part acceptance of the view of P. T. Barnum. What Barnum contributed — and at the same time delayed — was a sense that the public were entitled to see what they wanted to see. He stood at one pole of the axis, of course, thinking of little more than the shekels and the means to get them; with him the means were the ballyhoo, the promotion of the bizarre, the big noise. He knew the art of luring his public, of satisfying them quickly, of shooing them off to that mysterious freak called the "egress."

The reaction of orthodox museum men to Barnum in his own day was something approaching abhorrence. To them, the word "museum" had degenerated, and in general their fear of leaning toward the art of the circus forced them to adopt a high-brow aloofness. It was a case of one extreme encouraging another, and not until the present generation did definite signs appear that the more respectable museums wanted to effect a compromise. Today the museum man knows that he must be something of a showman (though perhaps he hesitates to use the term) and that his first consideration must be to encourage a clientele, to meet their demands, and to answer their (generally unconscious) questions. He has found out that he can accomplish this educative purpose without debauching his art or scholarship and without changing the quality of his show. In a self-confident manner, he functions not by any means in the spirit of the musical-comedy director training his chorus but in the spirit of the host thoughtfully preparing a friendly welcome.

What, then, will be the people's questions and demands which properly can be considered by the museum man in the postwar years? First, the public will greedily want to know more about the lands and the peoples overseas — all over the world, practically. Our horizon has been broadening and intensifying. It will continue to do so during the long period of world-wide rehabilitation, in which Americans are bound to have an important role. Already, there is a marked increase in interest in geography, cartography, ethnology, an increase in world consciousness more down to earth, more curious over details, than ever before. In the last War our soldiers were mainly in France, a country too much like our own to arouse curiosity. But the deserts of North Africa and the jungles of the South Sea Islands challenge the imagination.

That this enlarging of the horizon will be one of the sure results of the war is significant to me personally because of what I have learned about the past of my home town, New Bedford. A century ago and more, when the whaling industry was carrying New Bedford ships all over the globe, all the families in this small Massachusetts port would talk nonchalantly of antarctic seal islands, of Latin-American ports and politics, of Fiji cannibals, of fogs in Bering Sea. No New Bedford sailor returning home after a three years' cruise could tell any tall tales to impress his beloved, for she already had heard them all. In our hothouses was the night-blooming cereus from the Sandwich Islands (we never used the modernistic name, Hawaiian Islands); in gardens occasionally children could ride on the back of a giant Galápagos tortoise; and in parlors were carved war clubs from the Marquesas, and letters from the descendants of the Bounty mutineers, whose only acquaintances were in New Bedford. Many a whaling captain visited Pitcairn, sometimes to leave his wife for a few months on the island so that she might have proper care in childbirth.

Something of this familiarity with the truly foreign lands can be renewed, on a much wider basis, during the postwar years. The very fact that our soldiers and sailors have seen the exotic life will give the public an interest more zestful than could possibly arise from cold theorizing over internationalism.

Though the art museum can perform an important function in presenting the creative side of foreign culture, it can perhaps perform a still more important function in exhibiting the best of the art that is arising

out of the war and the best that will be influenced by the social forces in the postwar era. Art has traveled a long way from the periods when its greatest efforts were devoted to religious inspiration or to the glory of kings and emperors. Modern tendencies are democratic and show a sensitiveness to the living world which meets the public and the age squarely and honestly.

A second broad interest which people will have after the war will be a desire to discover the secrets of the "secret weapons" and their effect on the battles and the campaigns. Herein lies the great opportunity of the technological museums. It is true that almost all wars have had their secret weapons. The wooden horse of Troy — with a slight stretch of the imagination — can fall into the category. Many of the Roman engines, the Greek fire of Constantinople, the first gunpowder, the first fire ship — all of these had devastating and demoralizing effects on the enemy. The important fact about the present war is that it arrived when our science had reached a rich maturity and when the new theory of the blitzkrieg included surprise in all its phases as well as speed.

Apart from the secret weapons, whatever they may be, the known new weapons bear an import as yet only faintly perceived. We are amazed when we sense the revolutionary changes in warfare — more revolutionary than the changes announced by the battle between the *Monitor* and the *Merrimac*. We marvel at the advances science must now be making — we, who had considered ourselves rather blasé about such progress. We marvel at our productive capacity, born of the emergency but reared on an internal economic organization more sound, more elastic, more potentially energetic, than we had realized.

What, now, is the ultimate import of our material achievements, our scientific and industrial victories? This is another question the people will be asking, and they deserve a hopeful answer, hopeful proportionately to their patriotism and their patience, qualities of which they will be well aware when the struggle is over. How will the scientific swords of this war, those of friends and foes alike, be beaten into plowshares? How will industry, more self-confident now than ever before, respond to the desire for an improved world? Will the law of compensation be allowed to function freely and strike a balance for two great world wars?

These questions, and more of similar significance, can be answered in part, at least, by the museums. The modern techniques of exhibition, responsive to the times, will solve the problems of presentation. Within the century — within the decade, in fact — these techniques have rapidly matured. One used to think of the typical museum as a forbidding, never ending, dingy repetition of showcases containing the lifework of some gentle, scholarly biologist who classified, arranged, and studied his specimens for days without end. The biologist would be the curator, true to the derivation of his title — "one who cares for." Or else one thought of the typical museum as the haunt of some fond antiquarian, rummaging through his powder horns, shoe buckles, and yellowed documents, and trying out every visitor in the vain hope of finding someone who might share his single interest.

I once visited in Quebec a small historical museum connected with a convent. The museum was cluttered with relics of every description. The sister in charge tried her best to display her treasures and to be generally helpful, but the objects she sought had a way of hiding themselves, to be found only through stumbling over them or through tipping neighboring objects off the shelf. She loved her collection, but she was tired. "Oh, dear," she kept saying, "too many things; too many things!"

The plight of the elderly sister is shared — in spirit, at least — by many a museum man of the modern school. The collector tends to value his collection by the number of items. When the collector and the exhibitor are one and the same individual, a sacrifice of personal feelings has to be made. The art of the exhibitor is like all other arts: It implies judicious emphasis, and judicious emphasis implies judicious, and at times wholesale, omission. Without such omission the art museum becomes a bazaar, the historical museum a junk shop, and the natural-history museum a three-dimensional encyclopedia. The wise museum man changes his exhibits frequently; what he omits today, he brings out of hiding later; his institution acquires an atmosphere of freshness and life.

In connection with the typical modern museum one thinks of orderliness and simplicity, fluorescent lights and labels easily read, and a general "company's coming to dinner" atmosphere. The curator has left his microscope and dusted himself off. He has discovered that he wants guests — not guests who will accept him as is, but guests whom he will have to make a special effort to please and whom he must not weary at the very start.

One phase of the new museum technique has been the emergence of the idea of a "theme." The very idea that a theme is needed indicates a desire on the part of professional exhibitors to do something better than heretofore. Obviously an exhibit of, say, Colonial portrait painters carries its own justification and has its own ready-made theme; such exhibits will always have a place in our culture. There are other types of exhibits, however, which may well profit from a definitely pointed orientation, especially if it has a very personal appeal, inspiring the one who plans as well as the one who views.

The New York World's Fair of 1939 was an orgy of exhibition techniques of daring nature. From the museum man's point of view it was a monumental set of experiments, out of which were to emerge ideas and methods well worth the study for future reference. The New York Museum of Science and Industry, of which Robert P. Shaw, '23, is director, conducted a scientific survey of the fair's techniques, for the purpose of sifting out the wheat from the chaff.

Mention of the New York Museum of Science and Industry leads to consideration of another important trend, for that museum has been an energetic leader in the promotion of the "special exhibit." There is a definite appeal in the "something new," in the atmosphere of healthy living which comes from repeated change. The procrastination of a community dweller tends to keep him from viewing that which he knows will always be with him; yet he is potentially interested, perhaps keenly so, as is clearly proved by his tendency to visit a show of definite duration. (*Continued on page 508*)

First Voyage

How Temporary Orphancy from Formal Education Sped Elihu Thomson's Career—a Note for Schoolmen to Ponder

By David O. Woodbury

At the age of 11, Elihu Thomson passed his entrance examinations to the Central High School in Philadelphia — and was refused admission. Like many similar institutions, Central High functioned as a college, graduating its students after four stiff years of study directly into business and professional life. For a boy of 11 to enter its courses was out of the question. The lowest possible age for freshmen was 13, and even this was considered too young. As a consequence, Elihu was left a temporary orphan by the education system of the day.

His orphancy turned out to be a stroke of good luck. Using this unexpected gift of freedom, he laid the basis for a career which brought him fame throughout the world and elevated him to the rank of the foremost American scientist of his day. When Elihu Thomson died in 1937, then in his 84th year, he held nearly 700 patents, many of them basic to our present way of life. He had become a model for inventors and research men everywhere, a great thinker in many fields, and an educator whose genius for inspiring others had been signalized by his service as acting president of M.I.T. Most of all, he was beloved and revered by thousands, great and small.

It is interesting to look back for a moment to this formative period in the life of a great American to see how early freedom from routine helped in the flowering of his talent. In the story may be a strong hint that formal education can well be dispensed with, at least temporarily, when a pupil of independent mind becomes restive and wants to strike out on his own.

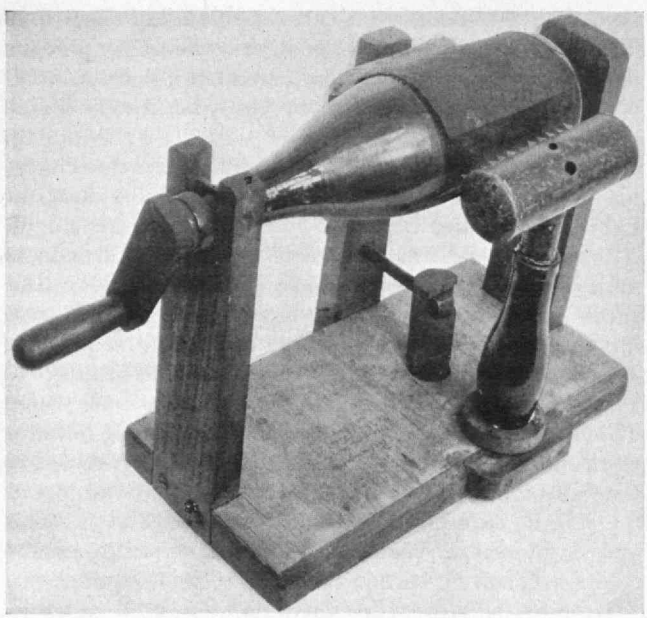
In the normal course of events, Elihu would have been required to repeat his grammar school studies for two years. But his teacher, George Stuart, had the wisdom and the courage to prevent this folly. It would do the boy good, said Stuart, to close his books for a time and catch up on recreation. Studies could wait. But he underestimated the mental hunger which had made young Thomson ready for higher education at 11 years. "Close my books?" the boy cried. "I would rather die!" It was not extravagance, but the rebellion of a mind keen beyond its years.

When Elihu reached home with the news, his conventional father was scandalized. But his mother rejoiced. She knew her son's capacity for original observation, his eagerness to explore nature and understand it. The enforced vacation was a boon, she said, such as few boys ever had. Elihu should have all the books he could read. He should build and experiment to his heart's content; he should have opportunity to find out "the go" of everything about him, just as James Clerk-Maxwell had done before him.

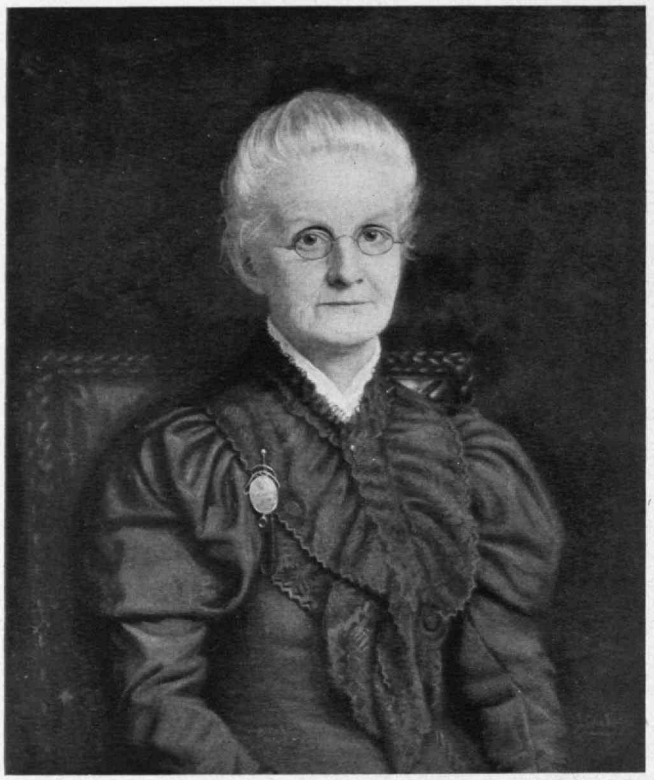
Thus, at a crucial moment in his development, a wise teacher and a sympathetic mother made him the rare gift of complete personal freedom. Like Tom Edison, who had been expelled from school because he was "addled," young Thomson escaped the shackles of unimaginative schooling in the very years when a private voyage among the mysteries of science could most powerfully formulate his ambitions. When he did go back to school, he had already set himself such a furious pace of research and invention that it carried him on without pause for 70 years.

The possessor of fabulous liberty, 11-year-old Elihu immediately became the envy of his friends. He responded by introducing a new kind of leather whip for tops and by starting a rage for "suckers" which picked up cobblestones on a string. Next he popularized a blowgun, using bits of raw potato for ammunition, and followed that with other ingenious troublemakers. Soon his cronies were dropping in regularly after school to see what fresh devilry might be learned. George Stuart cried for mercy and begged Elihu to change to constructive experiment.

Young Thomson took the hint. There was an iron foundry near by, and he resolved to go there and learn to make castings of his own. But from the first the project was disappointing. Iron would not melt on the kitchen stove, nor in a miniature cupola he made from a tin can. A much larger furnace also failed until he gave



A replica of the famous wine-bottle machine for the generation of electricity which was one product of Elihu Thomson's freedom



J. Colin Forbes's portrait of Mary Ann Rhodes Thomson, the wise and understanding mother of Elihu Thomson

up iron and charged it with type metal picked up in a vacant lot. This melted perfectly. After much experimenting with patterns and molds, he finally achieved a perfect casting — a fairly good imitation of a jackstone. Elated, he began turning them out in quantity, till he made them well enough to sell to his friends.

But Elihu's ambitions were high. He meant to cast a cylinder for a real steam engine. It must be of iron; the only way to get the necessary high temperature was to fit his furnace with an air-blast fan. Copying diligently from the foundry, he built a fan out of a round collar box, with a wooden shaft carrying blades of sheet iron. The driving pulley was a spool, and the power wheel a cheesebox cover coaxed from the corner grocer. Another spool made the crank, and the two wheels were belted together with string.

The blower worked well, and Elihu hastened to charge his furnace with bits of iron and coke. This done, he lighted it up and began to crank with all his might. After a time he was rewarded with a thin stream of molten iron trickling out onto the kitchen floor. But success was short-lived. The mold which he had made for the engine cylinder was too large for the furnace. The iron cooled long before the casting could be finished. This disappointment was heartbreaking, but young Thomson took it in his stride. He realized that foundry work on this tiny scale was impossible and resolved to waste no more time on it. For the sake of rounding out the job, he carefully filled the furnace with type metal and fashioned a beautiful but useless steam engine cylinder. Then he turned his mind to something else.

Despite its failure, the experiment had been valuable. It had been Elihu's first venture into research. He had learned how to test an idea by actual trial and evaluate the results. More important still, he had demonstrated his good judgment in refusing to continue up a blind alley, once discovered.

From the beginning of his "vacation," Elihu had been reading every scrap of scientific material that came within reach. The most absorbing thing was an English monthly which his father received, called the *Imperial Journal of Art, Science, Mechanics, and Engineering.* Here he found a series of articles on photography. At once his great ambition was to build a camera of his own. Tackling the lens first, he attempted to cast it in his miniature blast furnace out of chips from glass bottles. Once the shape was achieved, he planned to grind and polish it according to the directions in the *Imperial Journal.* But before he reached this point, he made a discovery. While breaking up a glass doorknob one day, he found that some of the fragments themselves had the power to magnify. Elihu immediately set to work with a pair of pliers, snipping off the irregularities to make the little lens round. This done, he mounted it in a wooden handle and produced a fair magnifying glass.

The camera was forgotten. Soon Elihu was turning out magnifiers by the dozen and selling them for two cents apiece. Then he discovered behind a drugstore a pile of broken bottles whose round bottoms made even better lenses. Before long, Thomson's optical invention was such a rage in his former school that Stuart again had to beg the boy to take up other research.

The Civil War soon cut off the *Imperial Journal* entirely. Elihu was brokenhearted and begged his mother to buy him a book on photography so that he could complete his camera. Mrs. Thomson searched high and low, only to be told that no book existed on this new art. Unwilling to go home empty handed, she bought the *Magician's Own Book,* hoping that Elihu's interest could be diverted to sleight of hand. But he was not to be consoled. Then one day, leafing through the disappointing volume, he found himself suddenly in a new world. This was no mere collection of parlor tricks but a whole encyclopedia of natural science. After a few chapters of magic came hundreds of pages of experiments with chemistry, electricity, magnetism, light, and sound. There was a picture on every page, showing how the apparatus could be made and used at home.*

By sheer good luck, Mrs. Thomson had put her hands on a complete elementary text on physics and chemistry — the ideal handbook for the home laboratory of a boy of 12. It explained combustion and the making of chemical compounds such as laughing gas; it told everything known of electricity and magnetism, and illustrated various machines that could be built to demonstrate them; it considered pneumatics, aerostatics, optics, mechanics, hydraulics, and acoustics; and it ended with a treatise on geometry and numbers and a section of "Practical Puzzles and Paradoxes."

The *Magician's Own Book* was a turning point in Elihu's life, for it gathered all his creative yearnings into constructive channels and offered him real scientific knowledge. All day long he was buried in its pages, learning most of them by (*Continued on page 500*)

* The *Magician's Own Book,* published anonymously by Dick and Fitzgerald in Boston in 1857, is worth examining today. Few modern books for boys can match it for lucidity and completeness.

Community Endocrines

Harmony among Controlling Groups Essential to Strength in Public Affairs As in Life of the Body

By John W. M. Bunker

COMMENCEMENT ADDRESS

THE history of life upon this planet as written in the record of the rocks tells the story of the rise, the dominance, and the disappearance of dinosaurs and dynasties. They failed because they did not adjust themselves to changing environments. It is a recognized biological principle that a plant or an animal persists and maintains its integrity only in proportion to the success with which it makes the adjustments necessary to enable it to fit its surroundings. This is the phenomenon of adaptation.

Certain instances of adaptation are obvious; others are more subtle and inconspicuous. A certain worm that feeds upon chestnuts has the problem of getting by the spiny armor of the chestnut burr; hence the worm has developed an elongated snout. The arboreal apes have prehensile tails. Land animals have sweat glands that provide an adjustment to changes of temperature, which occur over the earth with greater amplitude than in the waters, whose denizens cannot and do not need to perspire. The increased sensory adaptability of the human being who has lost his sight is an example of adaptation. Charles Darwin cited the case of the New Zealand species of parrot which, after the introduction of sheep raising into its environment and after getting in some way a taste of blood, changed from a peaceful vegetarian species into a destructive, bloodthirsty carnivore.

The local environment of the Institute has changed in unexpected and erratic ways during the past year, requiring adaptations of a high order of complexity. Orderliness has invaded the dormitories. Student populations have been evacuated therefrom, upon sudden notice of military necessity. Pedagogical and other problems have arisen to test the whole Technology population, students and staff alike.

The mechanisms of adaptation in vertebrates, of which man is a specimen, comprise a system of detection, communication, selection of possible responses, and final effector action. The detection of stimuli from outside the body is by means of sense receptors — cells or associations of cells attuned to special resonance with incoming disturbances of particular periodicities and amplitudes; thus the eye to see, the ear to hear, the tongue to taste, the tactile sense, and the thermal detectors of heat gain or heat loss and of the rate thereof. These exteroceptors are bombarded with impacts from without, impacts which impinge alike upon tissues unresponsive and receptive. As with the radio receiver which has been left untuned, broadcasts are of no avail to the nonreceptive tissues; only the tuned receivers are functional.

Responses to the inciting impulses, or stimuli, are determined not by the nature of the stimuli but by the fundamental character of the organism which receives them. For this determination to be made by the receiving organism, there must be a mechanism of selection or choice. In man this mechanism resides of course in the intelligence, of which the physical seat is the brain. Therefore, from skin to brain must be a communication system, the nerves — conducting fibers which are spun into strands, combined into cables, and finally run together in the conduit of the spinal column to the switchboard of the brain.

Man chooses how he shall react. In his infancy he stumbles and falls; and according to his state of health, according to what he has observed others to do in like circumstances, and, not least of all, according to what he thinks others regard as the proper thing to do, he howls with whipped-up anguish or he gurgles with glee. As he enters young manhood, there comes a day when, as he strolls garbed in whites on a social errand, a truck swoops through a mud puddle and splashes his splendor. Does he get mad? Probably. According to the stories, Marcus Aurelius in a like situation would have consoled himself with the reflection, "There is one joy-riding aedile whose chariot missed me," and in due course would have donned a new toga. It was that same Roman philosopher who pointed out that an insult is not conveyed by the utterance of another but is created in the mind of the recipient if he so chooses.

Man, then, can choose his responses. His reply to threat may be appeasement or combat; to calls for help he may pharisaically assume the scaly shell of indifference or, like the good Samaritan, may lend a hand. And whichever way he reacts, his fellow men, hearing about his behavior, will pass judgment upon him.

The response having been selected, communications again are invoked and efferent nerve impulses bring about appropriate effector action. In time, responses become cast to certain patterns, and the automatic switchboard of the cerebellum takes over the routing of the reply to situations which become repetitious. The pilot, for instance, maintains flight upon an even course or, with speed quicker than thought, goes into sudden maneuvers which save his plane. In the social environment man's relations with man depend upon the types of adaptations to which he has trained himself, upon the habits which he forms in the beginning or which he later changes for good and sufficient reasons. Thus character is expressed in daily actions and reactions — on the one hand, suggestive of tolerance and consideration; on the other, of arrogance and greed.

The outlook of man upon existence and therefore his behavior are colored by his physiological health. We recognize disease, a state of unhealth which has patent symptoms, and we know that disease is not conducive to optimism. The bounding health of childhood is associated with exuberance in the joy of living. It is well known that our feelings influence our actions. That which governs health, therefore, controls to a definite degree the selection of adaptive responses. The brain is the governing agent of behavior, but the brain in turn is subject to inconspicuous yet effective direction. The animal body maintains its integrity as a healthful entity only if the appropriate balance of glandular secretions be preserved in the blood stream.

Certain glands have on occasion been styled as the glands regulating personality. Saying so is inflating metaphor into hyperbole, perhaps, but it is a fact that completeness of living physiologically depends upon what we call an equipotential endocrine balance. Certain glands of the body, not over a dozen in number, each a community of cells drawing upon the common supply of earthy chemical elements circulating in the body, select from these elements and by recombination turn out particular products of chemical compounds which, acting here and there in proper balance, keep the vital organs in a state of health and normalcy. A body in which the endocrine balance is not maintained cannot be in complete health. Brain activity reflects this imperfection, and adaptive responses lose their efficiency.

The life of the body, then, is not directed by its government or by its component individual cells but, rather, by the products of controlling groups of cells, part and parcel of the total population, small in number but great in importance.

In the body politic are analogous groups of men who, associated in kindred interests, skills, and occupations, by their concerted activities influence government and hence the behavior of the community. The church constitutes such a community endocrine factor; the press is another; art, literature, and philosophy have their adherents whose opinions and output surely help to stamp a civilization; scientists and engineers constitute a group of tremendous potential power; employers and labor are other groups. The body politic will grow in strength as these groups act in concert with consideration and understanding for each other's interests and ideals. Working together in harmony, they constitute the force which conditions their government and determines the relations of their community with others.

How the endocrines of the body maintain their balance, each in respect to all others, is a mystery of life beyond our comprehension. We do know that certain excesses of one bring forth counteractivities of another; we do know that the very presence of opposing tendencies in the body makes possible the exquisitely proportioned variations in over-all effect whereby the delicate balance of physiological fitness is maintained.

But in the human counterpart to these regulating associations of the units of body structure, it is possible to reason certain ways in which analogous balances may be secured. Misunderstandings are the bases of dissension. Misunderstandings are the results of misinformation or lack of information. Contention loses its acrimony and is often dissolved when, face to face, contenders define those matters about which controversy has arisen. Conflicts spring up more readily among strangers than among friends. Communication of ideas and wide sharing of thoughts are a powerful prophylaxis against dissension. Isolation is not the attitude which avoids war.

WHAT are some of the things which scientists and engineers, the group in which you and I share membership, can guard against and what are some of the things we can cultivate so that we may contribute to the balance that is needed in human relations?

One of the chief things we must guard against is the danger of carrying into our professional lives an overemphasis on specialization, which some think is a characteristic of present-day scientific and engineering education. The wealth of fact and art spread before the scientist and the engineer is so great that no man can encompass it all. In athletics, only the few are sufficiently proficient in 10 branches of sport as to be serious contenders in the decathlon; most champions are specialists. When a triple winner arises in a meet, it is a matter of headlines in the news. Likewise in engineering and science, selection of one field or another is the effective method for technological coaching and learning.

Fortunately, advances in natural science have broken down the barriers which terminology had erected between physics, chemistry, biology, geology, and so on. These names are now accepted as designating centers of interest in a broad range of scientific findings. No boundaries exist between these sections of science. Their respective fields are unfenced; one merges into adjacent areas as the grass on suburban lawns. When my neighbor pulls out his dandelions, his action improves my own greensward next spring; and if I ever find out how to eradicate crab grass, I shall promptly tell all my friends.

If unchecked, however, specialization in a profession may lead to exclusion of interest in nonprofessional fields. That result is undesirable. For without information, there cannot be understanding. A metallurgist once used this figure of speech in an address: On the roof of a high building, a group of graybeards were shooting arrows into the air. The metallurgist looked up and espied a cloud from which depended a pair of dangling legs. "Who is that you are shooting at and who are you anyway?" he inquired. To which one toothless gaffer replied, "We are chemists. That feller up there is a physicist; he has his head in the clouds and his feet a long way off the ground." Note that in this fable the archers were not young men.

There is but one way to understand the other fellow — that is to get acquainted. One way to get acquainted is to resort to the good old custom of calling upon our neighbors. See what they are doing; listen to what they are interested to talk about; find out their aspirations. Then when they behave in ways peculiar to their own kind, their actions will be more understandable to us. Nothing equals personal observation as a means of gaining ungarbled information; conversation is more illuminating than literature, though reading has its value. (*Concluded on page 506*)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Corporation Elections

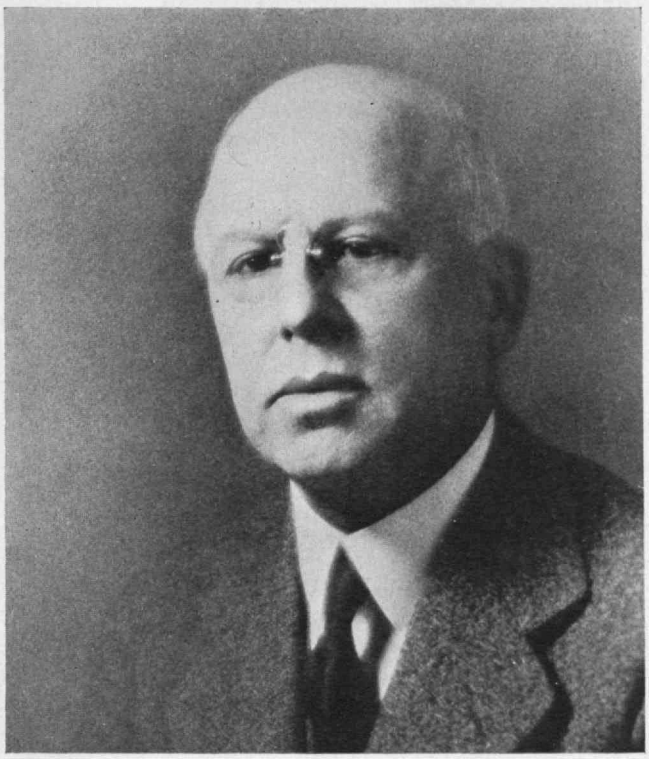
J. WILLARD HAYDEN, President of the Charles Hayden Foundation and a brother of the late Charles Hayden, '90, was elected a life member of the Institute Corporation on May 28. Elected alumni term members for five years were Francis A. Barrett, '24, Walter J. Beadle, '17, and Donald F. Carpenter, '22. Irving W. Wilson, '11, was elected as an alumni member to fill the uncompleted term of the late Alfred H. Schoellkopf, '15.

Mr. Hayden was born in 1874, the son of Josiah W. and Emma A. Hayden, and was educated in the public schools of Boston. He was long associated with the firm of Hayden, Stone and Company, of which his brother was the founder, and he became president of the Charles Hayden Foundation in 1937. Mr. Hayden is a director of the Eastern Steamship Company, the Equitable Trust Company, and the Eastern Massachusetts Street Railway Company. During World War I, he was director of demobilization for the Young Men's Christian Association. His clubs are the Algonquin, University, Corinthian Yacht, and the Havana Yacht and Country.

William H. Bovey, 1871–1943

WILLIAM HOWARD BOVEY, '94, a life member of the Institute's Corporation since June, 1924, died in Edina, Minn., on April 26. Mr. Bovey, who was 72 years old, was widely known in the milling industry of the Middle West. Associated with the Washburn-Crosby Milling Company for 33 years, he held the post of vice-president in charge of milling operations upon his retirement in 1928, when his firm became a division of General Mills. Since then he had been vice-president of the Cannon Valley Milling Company, of which his son, William H. Bovey, Jr., '22, is president.

In recent years Mr. Bovey spent much of his time in the direct application of his great interest in education and philanthropic projects. His concern for the welfare and progress of the Institute was indicated by his active participation in the affairs of the Corporation. In 1914 he became president of Dunwoody Industrial Institute and was associated with William H. Dunwoody in the development of this vocational training school. Relinquishing his post as president in 1937, he became chairman of the board of trustees. From 1913 to 1933, Mr. Bovey was a member of the Minneapolis Park Board and had served several terms as its president. He had also been a trustee of Carleton College and a director of the Carleton Corporation.



William H. Bovey, '94

The Review is not published during the summer months following July. This issue, therefore, concludes Volume 45. Number 1 of Volume 46 will be published on October 27 and dated November. Readers who bind their copies are reminded that if they possess nine issues of Volume 45, their files are complete. An index to the volume will be ready on August 15 and will be supplied post free upon request.

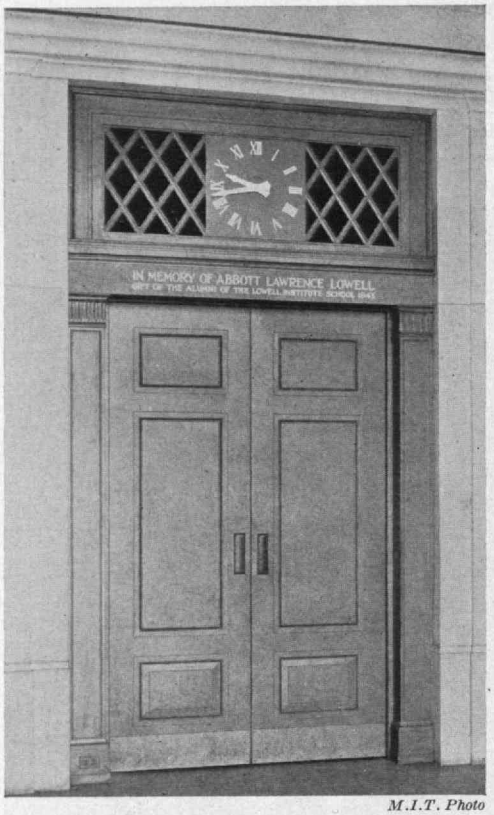
May Graduation

GRADUATION exercises for graduate and undergraduate students of the Institute who completed their academic work after the regular commencement last February were held in New England Mutual Hall, Boston, on the evening of May 28. Dean John W. M. Bunker delivered the commencement address.

A total of 279 degrees and 10 certificates of public health were awarded to 261 candidates. The distribution of degrees was as follows: doctor of philosophy, 16; doctor of science, 13; master in city planning, 2; master in public health, 9; master of science, 139, of which 28 included the degree of bachelor of science; bachelor in architecture, 1; and bachelor of science, 99. Among the graduates were 17 young women.

Athletes Acclaimed

THE 1942–1943 season for Institute track and crew athletes was one of the most successful in Technology annals. Oscar Hedlund's track team ended an undefeated



M.I.T. Photo

Presented by alumni of the Lowell Institute School, this clock in the lobby of the Rogers Building honors the memory of A. Lawrence Lowell, trustee of the Lowell Institute and life member of the Technology Corporation.

season, having won from Brown, Holy Cross, Boston College, and Tufts in two triangular meets. The scores were as follows: *First meet:* M.I.T., 68¾; Brown, 42; Holy Cross, 24¼. *Second meet:* M.I.T., 72; Boston College, 47⅓; Tufts, 45⅔.

The M.I.T. crew season this year included only two regattas: the first, a dual race with Harvard on the Charles in Cambridge on April 24; and the second, a five-crew regatta on the Severn in Annapolis on May 8. With less than three-quarters of a length separating the shells, the times for the Harvard-M.I.T. race were: Harvard, 6:59; M.I.T., 7:01.5. At Annapolis, M.I.T. finished second behind the Navy shell, defeating Princeton, Pennsylvania, and Columbia.

Our varsity crew was by far the best in recent years. Buck Walsh, Navy coach, paid the crew the compliment of calling it the best M.I.T. crew he had ever seen.

Finale

WINDING up another year of varied operations, the Alumni Council held its 233d meeting on May 24, the place being the University Club in Boston. Presiding in the absence of President Francis A. Barrett, '24, was Harold Bugbee, '20, Vice-president of the Alumni Association. Presentation of annual reports of the various officers, committees, and councils of the Association was the principal business of the meeting. Notwithstanding adjustments and alterations in usual practice which have been made necessary by the war, the reports indicated, the Council's work for the year as a whole has been effective, notably in its fostering of active support for the Institute by Alumni and in its seeking of further ways for the utilization of the energies of its members.

Speaker of the evening was Robert S. Harris, '28, Associate Professor of Biochemistry of Nutrition at the Institute, whose task was the giving of some answers to the question, "What Shall We Eat?" Increased per capita consumption of food; shipments of food to the armed forces for feeding the troops, for stock piles, and for feeding Allied troops; and Lend-Lease shipments, mainly of milk powder, egg powder, fats, soya, and cheeses, were cited by Professor Harris as the causes for present food shortages. Surveying the disposition of stocks of various primary foods, he did not find much basis for optimism about dietary prospects for the year ahead.

Problems of rehabilitating agriculture and livestock in Europe after the war were sketched by the speaker, who pointed out the great need for seeds that will be encountered, as well as the fact that few of the right strains for European cultivation are produced in this country. The need for farm machinery in Europe in order to make a rehabilitation program effective, Professor Harris argued, must be reckoned with as a manufacturing problem on this side of the water.

Messrs. President

TEN national professional scientific or engineering societies at present give evidence of the professional activity of M.I.T. Alumni. President of each of the groups in the following list is a Technology man: American Chemical Society, Per K. Frolich, '23; American Institute of Consulting Engineers, R. E. Bakenhus, '96; American Institute of Electrical Engineers, Harold S. Osborne, '08; American Society of Heating and Ventilating Engineers, Everett O. Eastwood, '02; American Society of Mechanical Engineers, Harold V. O. Coes, '06; American Society for Testing Materials, Herbert J. Ball, '06; American Society for X-Ray and Electron Diffraction, Martin J. Buerger, '24; American Standards Association, Rufus E. Zimmerman, '11; National Association of Food and Drug Officials, Hermann C. Lythgoe, '96; Society of Automotive Engineers, Mac Short, '26.

Planner Plus

The Review has pleasure in, on occasion, introducing its readers to outstanding women graduates of the Institute, and this is one of the occasions.

CITY PLANNER, author, wife, and mother, Flora Crockett Stephenson, '37, the first woman to be graduated in the Institute's Course in City Planning, is in England working side by side with her husband, Gordon Stephenson, '38, on important research on war building.

Mrs. Stephenson was born in New Jersey, a descendant of a seafaring family — of which she is very proud. She transferred from Mount Holyoke College to Technology, where she received the degree of bachelor of architecture in city planning in 1937 and a master's degree in city planning in 1940. In 1938 she married Gordon Stephenson, who had come from England on a fellowship to study in the School of Architecture. He received the degree of master in city planning in 1938.

On their wedding trip, the Stephensons drove to Mexico City to attend the 16th International Housing and Town Planning Congress. They wrote an interesting report of this congress for *Keystone*, the journal of the Association of Architects, Surveyors and Technical Assistants in England.

The names of Flora and Gordon Stephenson have appeared beneath the titles of articles in many English periodicals. They write not only about the architectural and city planning phases of camps and housing but also about the cultural and social aspects involved. For a special issue on camps of the *Architects' Journal* of July, 1939, they wrote a 16-page survey of recreation, school, and summer camps in eight countries.

The Housing Centre at 13 Suffolk Street, London, put on an exhibition of camps in March, 1939, under the direction of Mr. Stephenson. Mrs. Stephenson wrote an article on camp administration for the handbook published after the exhibition. In an accompanying flier appeared the following tribute: "The Housing Centre wishes to thank all those who have contributed material to the Exhibition and especially . . . Mrs. Gordon Stephenson for her invaluable help in preparing material for the Handbook and in many other ways. The important research she is making into the subject of camps has gone far to make possible the representative nature of the Exhibition."

In 1942, the Stephensons made a survey for the Community Centres Joint Research Committee. They visited and studied camps all over the British Isles. As Mr. Stephenson was busy with war work, most of the material was assembled by Mrs. Stephenson. Their findings were published in an illustrated book entitled *Community Centres*. In this book, which is the first compilation of data on the subject, they give detailed descriptions of community centers, their architectural plans, their service to the community, and their position in a war world.

From the beginning of their married life, the Stephensons have been dogged by the horror of war. In September, 1938, they stepped off the boat into England — to be greeted by the necessity that they be measured for gas masks, as the Munich scare was in the air. They were in London during the early months of the war, and later went to Liverpool, where the bombing was so severe that Mrs. Stephenson went to North Wales. She stayed there until the British Government sent her with her husband to Staffordshire. They later returned to London.

A daughter, Gail Crockett, was born to the Stephensons on April 12, 1942, in Bebington, Cheshire. From all accounts she is a husky and healthy young lady, in spite of being a war baby.

At the present time, Flora Crockett Stephenson is trying to find time from her duties as a wife and mother to write a new book. Gordon Stephenson is working with the Ministry of Town and Country Planning on reconstruction plans for London. Highly successful in their chosen field, they are carrying on the Technology tradition of service.



M.I.T. Photo

Entrance to the Francis Russell Hart Nautical Museum

Books for War

AMONG the hundred volumes selected by the American Institute of Graphic Arts to make up a traveling exhibit entitled "Technical Books for a Nation at War," a considerable number have especial Technology interest. Physical attractiveness, durability, suitability to purpose, and "the success with which the publisher had solved the various problems imposed by editorial content and conditions of production" were the standards of selection used in choosing books for the exhibit. The Institute's own Technology Press imprint appears on one of the volumes, *Electric Circuits*, issued through John Wiley and Sons, Inc. Following is a list of the volumes of particular M.I.T. significance:

Fighter Facts and Fallacies, by John G. Lee, '21, with introduction by Jerome C. Hunsaker, '12; William Morrow and Company, 1942.

Simplified Theory of Flight, by H. Erich Nietsch, '38, and Thomas C. Gillmer; D. Van Nostrand Company, Inc., 1941.

(*Concluded on page 514*)

THE SKILLFUL SKULL

(*Concluded from page 486*)

features of a system of arches with something of a spherical form, there would be a danger that blows delivered on top of the head might result in frequent fractures of the bones. This contingency, we have already pointed out, is partially met by the arches of the skull, the fact being well known that an arch is better able to resist stresses of this kind than is a sphere. In addition, the skull is made up of a fairly large number of independent bones, 22 in fact, which are joined to one another by means of denticulate processes that dovetail with those of the opposite bone and thus form the sutures of the skull. Until middle age, there is a certain amount of give, or tolerance, at these joints. The younger the person, the greater the amount of give. It is at these joints that the bones may take up the spread which may be caused by a sudden powerful blow on the head.

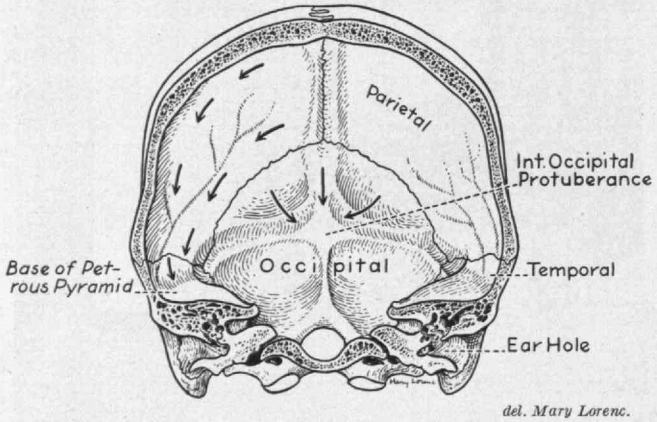


Fig. 8. Section through the top of the skull passing through the back of the earholes. Note how the features of the arch and the sphere are combined in its shape; how the petrous, or temporal, pyramid forms an enormous buttress which at the same time also serves to receive the forces traveling downward from the top and sides of the skull. Note the great sagittal arch in the middle of the skull and how it terminates at the internal occipital protuberance and then passes toward each side.

The fact has already been mentioned that the base of the skull is somewhat weakened by the number of foramina which pass through it as well as by the fissures which traverse it. This weakness would be very considerably greater but for the presence of a remarkable bone the architecture of which would alone require a treatise to describe. This is the temporal bone (Figs. 2, 3, and 8). It consists of a lateral portion and a pyramidal projection. The former fits like a shield, or scale, over the adjacent bones on the side of the skull, and its upper uneven border describes about two-thirds of a circle. The pyramidal projection extends forward toward the center of the skull and forms part of the base of the skull. It is so hard a bone that it is known as the petrous portion of the temporal. It houses the sensitive organs of hearing, the semicircular canals, and numerous important nerves and blood vessels. It is a very fortunate thing, therefore, that this portion of the temporal is so hard a bone, since it must be able to withstand every possible form of stress and strain. That it successfully does so is testified by the fact that of all the bones of the skull it is the one least frequently injured.

The form of the petrous bone is interesting: A four-sided pyramid arising at right angles from the squamosa or scale of the temporal bone, it lies upon its side with its apex pointing toward the body of the sphenoid bone and a good part resting against the basilar portion of the occipital bone. Two of the sides of the pyramid lie within the interior of the skull, and two lie outside it. Within the interior of the skull the hindmost side is perpendicular, whereas the other side is above this and more or less horizontal in position. The external sides are not so flat or smoothly surfaced as the internal ones, being rather roughened and somewhat excavated by grooves for the large vessels which lie in relation to them; but their positions are complementary to the internal ones. It would seem highly probable that a large number of the shocks received by the head on the top and side walls of the skull are transmitted through the squamous portions into the petrous portion of the temporal bone, which thus serves as yet another great shock absorber for a good part of the base of the skull.

From this brief, and unavoidably sketchy, account of some of the principles governing the architecture of the human skull, the reader will be able to judge for himself how alike are the fundamental principles which determine the relations among structures and the functions they subserve, both in the animate world of nature and in the world of artificial structures which man himself creates. It should be apparent that those principles are actually identical and that the more closely man approaches mastery and improvement of them, the more nearly perfect are structures he builds likely to be.

THE NEXT DECIMAL PLACE

(*Continued from page 482*)

himself become a special consultant to a branch of the War Department. At Brown University a strong graduate school of applied mathematics has been established. A considerable group of well-qualified young mathematicians came for training to a special intensive summer session conducted by this school, and its regular sessions have now presumably been established on a permanent basis. At the M.I.T. such Departments as Mechanical Engineering, Electrical Engineering, Aeronautical Engineering, Meteorology, and Geology have long had men of the highest research-engineering type, well versed in advanced mathematics; such men, together with representatives of the M.I.T. Mathematics Department itself, now form an interdepartmental committee to sponsor and develop applied mathematics. At New York University a smaller but excellent group is similarly emphasizing applied mathematics. In addition to these specialized groups, nearly all the former centers of pure mathematics are increasing work in the applied fields.

The whole atmosphere of mathematics in America thus is altering. It is a change that may be counted on to permeate the future of science and industry on this continent. The review made for the National Resources Planning Board in 1940 showed that, despite the enormous magnitude of American industry, it employed only about 150 mathematicians (not including statisticians and actuaries). Of the 150, one-third were in the elec-

(*Concluded on page 498*)



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Today the copper industry is producing all-out for war. No copper is available for any other use. But post-war planners with specific problems in metals are referred directly to the Revere Executive Offices in New York.

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THE NEXT DECIMAL PLACE

(*Concluded from page 496*)

trical communications industries alone. Today, when refinement to one additional decimal point may mean the difference between a mediocre and a superior weapon, the demand for industrial mathematicians by the Office of Scientific Research and Development, the Navy Department, the War Department, the National Advisory Committee for Aeronautics, and the various laboratories and manufacturing plants which are producing the new weapons, is in excess of the number that the existing schools can supply. Indeed, the output of several additional schools of applied mathematics could easily be used in the war effort, but there are not teachers enough to man them.

The service of mathematics in war of course is not limited to assisting or guiding engineers in the design, production, and testing of a weapon. It extends to the use of the weapon, the organization and direction of the fighting resources, the participation in battle. At West Point and Annapolis, the courses for the training of cadets and midshipmen are founded on solid years of mathematics; the study of physics, chemistry, and other technological subjects is strongly mathematized; and these subjects are not elective.

In contrast with this long tradition of rigorous training in analytical and objective habits of thinking at West Point and Annapolis, most of the American universities and liberal arts colleges have gradually broadened their requirements, making mathematics an elective subject, so that in consequence undergraduate interest in it sagged to a new low. Only a handful of students took any mathematics in college, and many of the high schools and preparatory academies reduced their mathematical requirements to a very elementary level. In 1942 a prominent industrial research director said that even the boy who finishes high school with an "A" grade in mathematics has a poor foundation on which to build his future work in science.

These deficiencies in our educational system have been a serious handicap in the present emergency. The wartime Army and Navy, confronted with the problem of recruiting large numbers of men as future officer material, found ignorance of mathematics one of the most serious bottlenecks. From his experience as chief of the Navy's Bureau of Navigation in 1941, Admiral Chester W. Nimitz reported that 4,200 freshmen in 27 leading colleges were examined for admission to the Naval Reserve Officers' Training Corps and that 68 per cent failed to pass the entrance test in arithmetical reasoning. Only 10 per cent had studied elementary trigonometry, only 23 per cent had taken more than a year and a half of any mathematics in high school. When it came to college graduates — men who had successfully completed their four years — of 8,000 who were considered for commissions as ensigns, 3,000 had to be rejected because they were woefully deficient in mathematics.

Army engineers report much the same conditions. Sifting young men for the highly technical and specialized services of the Corps of Engineers, the Signal Corps, the Air Forces, and the Artillery, they found that a large proportion of the recruits were unfamiliar with geometric relations and many were unable to perform simple arithmetical computations. In one Coast Artillery regiment, arithmetic was so foreign to the capacities of most of the men that the entire group had to be put through months of instruction. Aviation in particular calls for a firm groundwork in elementary mathematics by pilots, navigators, and bombardiers; they must be proficient in arithmetic and geometry, and must also have some grasp of physics and trigonometry. With crews averaging three men per plane and with aircraft being produced on the scale of 100,000 a year, the training courses must care for several hundred thousand men a year for the air arm alone — while other mechanized branches of the Army are demanding equal or corresponding mathematical training for their personnel.

The high-school and college curricula have been made over on a nation-wide scale to meet these needs of the Army and Navy, and mathematics is resuming its historic place in education. Whether this trend will continue as a postwar policy, one can only conjecture. But, at any rate, many hundreds of thousands of young Americans will have been introduced to a scientific tool of great usefulness and to a method of thinking which cannot fail of influence on their lives in peace as well as in war.

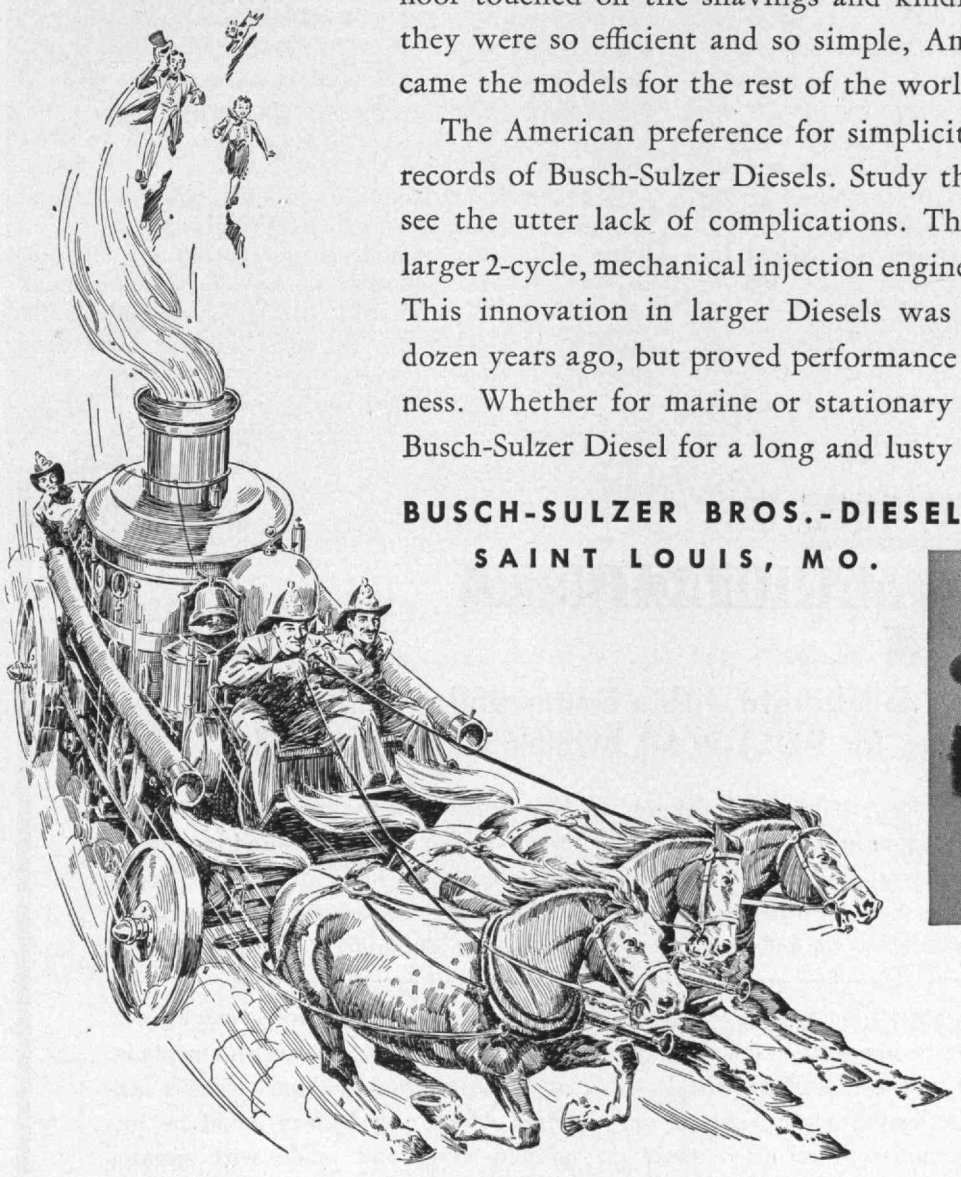
While the Army and Navy, through their contractual arrangements with selected colleges, are thus training military and naval recruits, hundreds of other institutions have made shifts in their teaching arrangements. These are designed to provide training for young civilians in order to prepare them for service in war industries, laboratories, arsenals, ordnance works, navy yards, and other places where mathematical knowledge is essential to efficient production. At the close of 1942, for example, Brooklyn College in New York had 4,000 students studying mathematics — 3,000 in day courses and 1,000 in night courses, with an increasing proportion of young women in the classes. The program here is typical of the intensive acceleration of teaching in scores of institutions, particularly municipal colleges and colleges in large population centers.

The return to mathematics has educational significance in that the teaching of mathematics can be harnessed to practical problems. Instead of taking up mathematics as recent college graduates have — as an enforced exercise in mental gymnastics, a cultural something necessary to fulfill the requirements of the law and win a college degree — young people of today approach the subject as a tool to be used. Newton invented the calculus because he needed a tool with which to describe the path of a moving body whose velocity was changing at a fixed rate, a very real problem with which he was wrestling at the time. Similarly vector analysis had its origin in the need for a tool with which to attack a particular problem in mechanics. When taught the calculus and vector analysis as tools to be used in making and using guns, aircraft, submarine detectors, and warships, students partake of some of the satisfaction of the inventors who devised these powerful techniques. A beautiful thing loses none of its beauty and none of its importance by being found useful, and at the same time it becomes more interesting, more comprehensible, and more acceptable. Therein lies a promise of possible permanence for our mathematical renaissance.

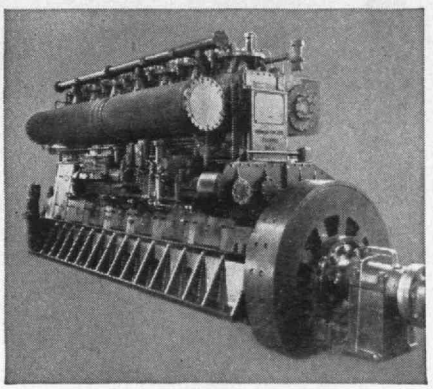
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FIRST VOYAGE

(*Continued from page 490*)

heart. In later life he repeatedly fell back upon this splendid course of training in demonstrating to others. All the fascinating exhibitions of parlor magic with which he thrilled every child who knew him originated in this extraordinary book.

By this lucky turn of fate was Elihu Thomson's scientific career begun. A special providence apparently brought him the right influence at the critical moment, as it had done with Faraday, Henry, and Edison. Genius, it seems, is the special concern of heaven through the medium of inspiration from a book. For example, Joseph Henry at 13 was an apprenticed watchmaker, a trade he detested and planned to abandon for the stage. One day he chanced to pick up a book called *Lectures on Experimental Philosophy*, which a boarder at his grandmother's house had left open in the parlor. He began to read it casually but was soon so enthralled that he determined to make science his career. Eagerly he took courses in natural philosophy at the Albany Academy, was graduated with high honors, and became its professor of chemistry. He was soon a world celebrity.

Faraday's inspiration was remarkably similar. At 14, he was apprenticed to a London printer and had to do the bookbinding for the establishment. He disliked this as much as Henry did watchmaking. Finally an encyclopedia came in to be bound, and Faraday chanced to read its few paragraphs on electricity. His future suddenly became clear. He began attending the public lectures on chemistry which Sir Humphry Davy was giving at the Royal Institution, and he made such excellent notes on the discourses that Davy hired him as his private assistant. In a few years Faraday had become a greater scientist than Davy himself.

Elihu Thomson at 12 determined to make "experimental philosophy" his profession. At first electricity interested him beyond all else. Its mysterious actions offered endless possibilities for original discovery. In the *Magician's Own Book* he found an article on how to make a friction machine to generate electricity. "It is very easy to make a glass machine of the cylindrical form if the maker cannot afford to buy one . . . ," the article explained. These were magic words to a boy with skillful hands and an inventive mind! All that one needed was a wine bottle, a spindle and crank, a leather pad, and a piece of silk. The article assured the young reader that the machine, once made, would do a host of experiments with sparks, among them "the electric kiss," "imitation thunderclouds," and "how to draw sparks from the tip of the nose."

For several days Elihu was occupied with the difficult business of boring a square hole through the bottom of a wine bottle, then mounting the bottle on a shaft to revolve smoothly against a leather pad when a crank was turned. His familiarity with glass soon solved this problem and other smaller ones, and the homemade friction machine was ready. With the first turns of the

(*Continued on page 502*)

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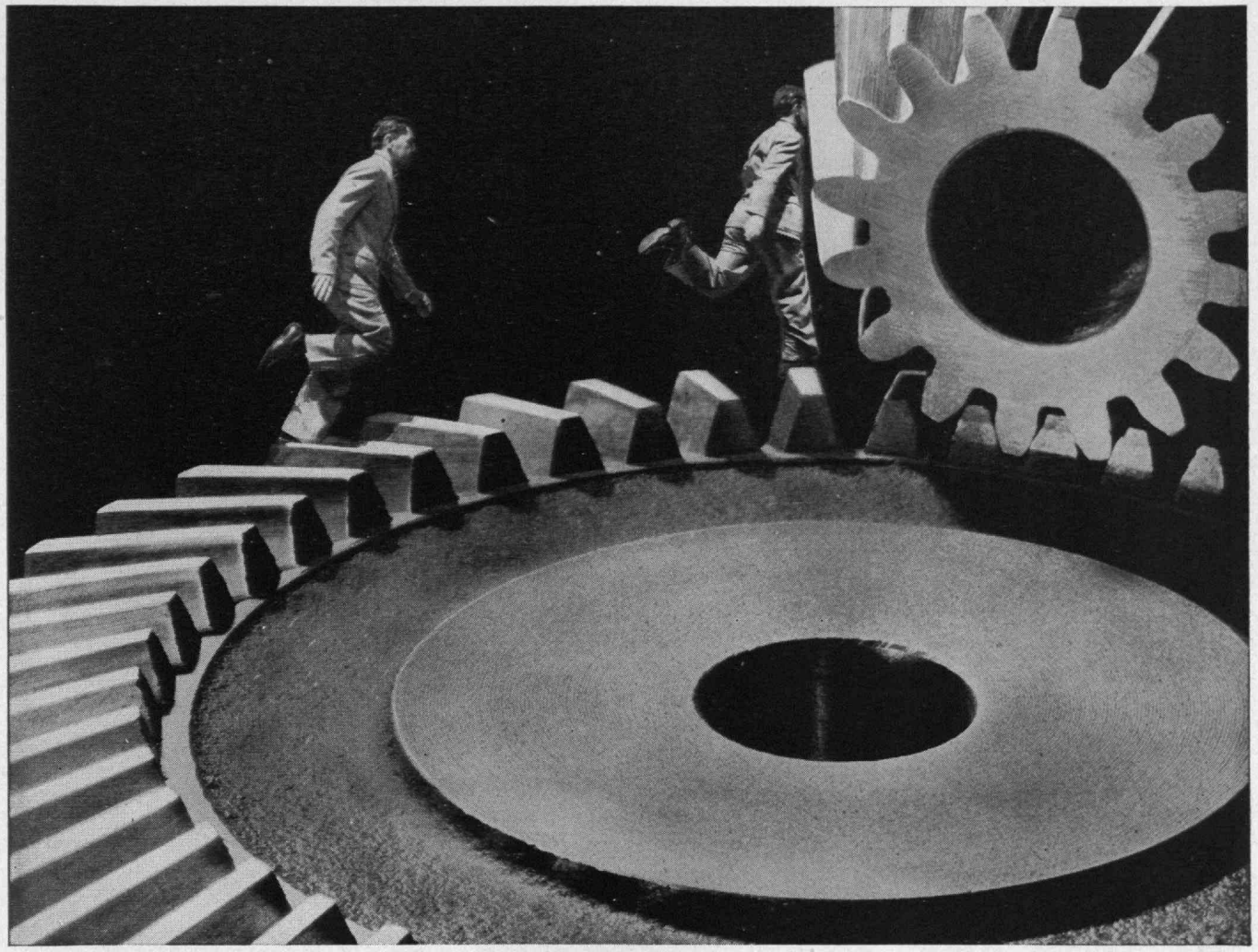
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FIRST VOYAGE

(*Continued from page 500*)

shaft of his apparatus, the young scientist was rewarded with a beautiful spark almost half an inch in length. He next followed instructions for building a small Leyden jar and learned that the book was inaccurate in suggesting that all glass has good insulating qualities. Fruit jars of a pink color would not hold electric charges at all. He decided that the iron salts in the glass were to blame, and took care thereafter to use only jars of pure white.

Soon after the outfit was ready, Elihu's father returned from a business trip to Cuba and asked what his son had been doing with his time. The boy fetched his friction machine and exhibited it proudly. But Daniel Thomson was not impressed. He did not believe in praising his children if it could be avoided. Elihu gave the crank a few quick turns and invited his father to grasp the terminals. Thomson did so, smiling. The feeble discharge made scarcely any impression on his tough machinist's hands. He brushed the whole experiment aside as unworthy.

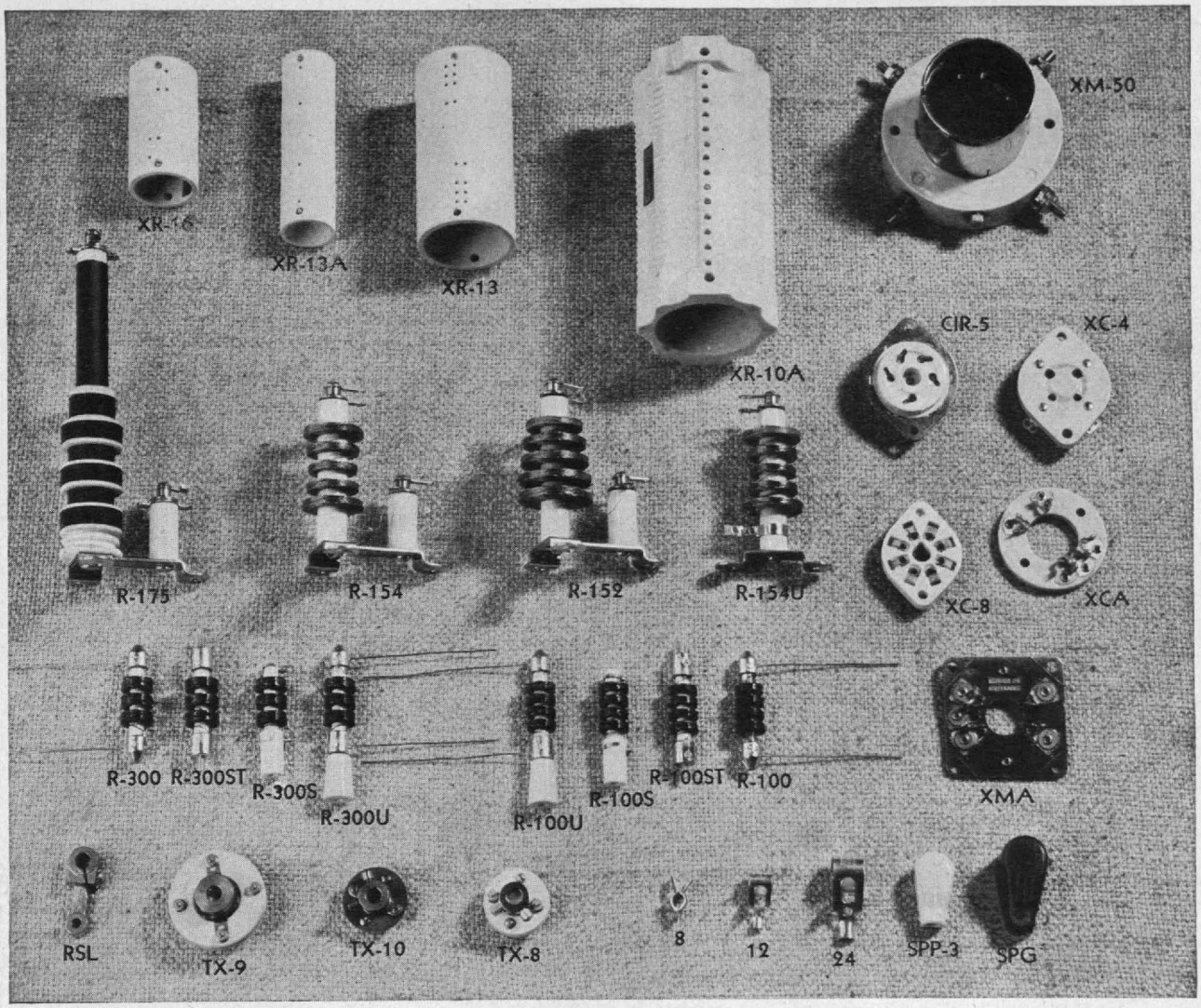
The young experimenter returned to his bedroom workshop, determined to find a way to give his father a real electric shock. If one Leyden jar would not do it, he must build a whole battery of them. But without the tin foil necessary to make them he was forced to invent a substitute. He tried immersing a number of jars in a big bowl of water and partially filling them with it also. To his delight the scheme worked perfectly; the sparks from the machine were fat and bright and gave promise of saving his reputation.

One snapping cold winter night he set the stage for his comeback. "I cranked the electric bottle machine hundreds of times and got a real charge in my battery," he wrote gleefully, years later. "Then, most innocently, I requested my father to attend the experiment and complete the circuit. He did so readily, believing that this time he would put an end to my foolishness."

What happened frightened even Elihu. The shock threw Daniel Thomson into the air and landed him on his back, where he lay cursing till his wife ran in and picked him up. On his feet again, he stood glowering at the machine, rubbing his benumbed arms. The boy waited silently. This was surely the end of his home laboratory. Then his father held out his hand and enthusiastically gave Elihu his approval. From that moment on, the boy's place as the scientist of the household was secure.

From the *Magician's Own Book*, Elihu next learned how a telegraph was made and how to set up the galvanic battery to run it. This led him to experiment with the innumerable mysteries of chemistry and physics that crowd the everyday world. Trying them all, he mastered the known fundamentals of the physical world. There were no limits to his experiments except those of his own skill and patience. The dangerous forces he might release depended solely on his own judgment and natural caution. He was already too well informed to risk his life, but he got splendid training in invention from the constant necessity of finding and adapting his

(*Concluded on page 504*)



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FIRST VOYAGE

(*Concluded from page 502*)

own materials. His complete lack of money to buy what he needed was a great aid in his developing and understanding the potentialities of everything he used.

Thus the fashioning of a bent nail to make a pair of electromagnets was not a serious problem, but the insulated wire for winding the coils upon them taxed his ingenuity to the utmost. Out of his own head he devised a way of winding cotton thread on the bare wire, and so repeated an important invention which Joseph Henry had made at Princeton College many years before. The magnets were presently forgotten, but the knowledge of insulation remained to help the boy later when he built his first dynamo.

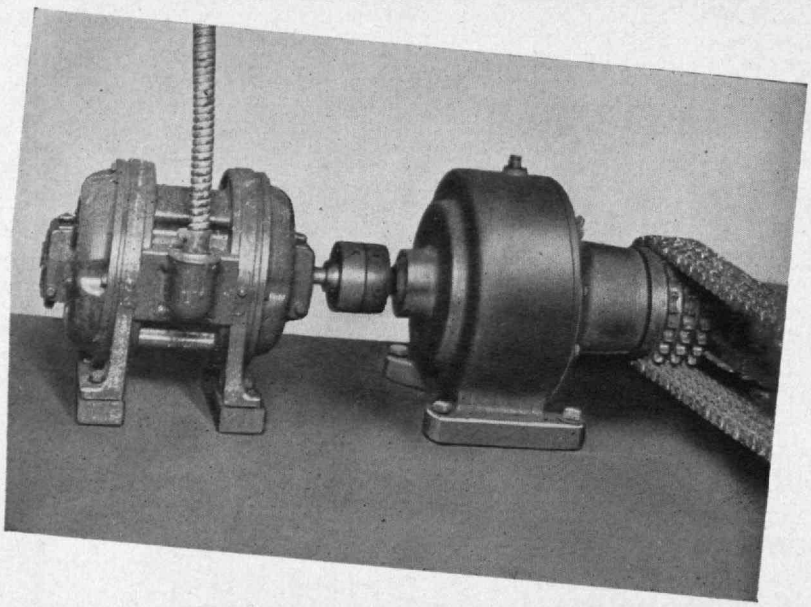
When the telegraph was duly successful, Elihu's interest in experimental laboratory work temporarily abated. Now he turned to sleight of hand and ventriloquism, mastered them, and then spent a short interval trying to educate a parrot his father had brought home from Puerto Rico. When the bird refused to learn the multiplication table, the boy took to the mechanical arts. With his father's help, he got permission to hang around the Philadelphia Navy Yard, not far off. There were fascinating things going on there, among them the building of the *Tonawanda*, the first battleship-of-the-line of the United States Navy to be armored with iron, and one of the first driven by Ericsson's screw propeller.

The yard was seriously shorthanded. After a good deal of pleading, Elihu got the job of running for an hour each noon the donkey engine which was finishing the hole for the propeller shaft in the battleship's sternpost. He was a proud and happy boy to feel that he had so important a part in fighting for the Union. For weeks he spent all his time there, watching every operation of shipbuilding, especially the installation of the great slabs of armor plate along the *Tonawanda*'s water line.

At length, in the fall of 1865 at the age of 12½, Elihu went back to grammar school to repeat his examinations for Central High. George Stuart welcomed him with delight. He had moved to a school two miles away but insisted that Elihu follow him there. He wanted to put the last loving touches to the boy's primary education himself. Gladly Elihu made the daily four-mile walk and often went in the evening to the schoolmaster's house, where they discussed his future in every detail. Elihu told him he was sure now that he wanted to be a scientist.

One day Stuart kept him after school, and when the building was quiet took him to a big cabinet whose glass doors were always locked. Elihu had stared through those doors many times at the wonderful array of apparatus within — friction machines, electromagnets, galvanometers, and all the rest. Now George Stuart unlocked the doors and lifted the treasures out, one by one. And they stayed into the night to experiment, to question, to remember, tramping happily side by side with the scientists of the shadowy past.

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For the barnacle, he pointed out, is a symbol of all those things that have *not* been done — a tiny marine organism that costs us millions every year — simple, "impossible" things that are still to be accomplished.

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Under the secrecy of forced-draught war research, many incredible accomplishments — seemingly impossible within our time — have already occurred. For obvious reasons, these may not be discussed, but of one thing we can be certain: The end of this war will inaugurate the greatest era of industrial surprises since the age of machinery began.

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(*Concluded from page 492*)

We take for granted the printed word and can hardly realize what an invaluable aid to human progress the art of the book has been. Since printing was invented, fewer rediscoveries have been made. Previous to the Fifteenth Century, many a stimulating concept regarding the nature of the universe had been formulated, only to become lost through lack of permanent records. Pythagoras perceived that the earth moved around the sun, but few took him seriously, and because of lack of publication his thesis was forgotten. Ptolemy, 600 years later, with an eye perhaps to the powers-that-be of his time, took the opposite stand and got away with it. When Copernicus, more than a thousand years thereafter, backed up Pythagoras and, moreover, put his theories into a book — which he was able to do thanks to the achievements of Gutenberg — the record was fixed for all time.

Today we are in position to learn of our fellow men as no peoples have ever been before. In 49 days the airplane carrying a questing American citizen enabled him to interview and be interviewed in Africa, the Near East, the Far North, and the Orient, and then to return via air over the bridge that once connected what are now Siberia and Alaska. One who reads his report cannot fail to be impressed with the evidence that there is much among the peoples of other lands which is worth our study and understanding.

And in respect to travel, one may recall the fairy tale from which Horace Walpole quoted in a letter to a colleague in 1754. It is the story of the three princes of Serendip, who "as they travelled, . . . were always making discoveries, by accidents and sagacity, of things which they were not in quest of: for instance, one of them discovered that a mule blind of the right eye had travelled the same road lately, because the grass was eaten only on the left side, where it was worse than on the right. . . ."

In this suggested quality of serendipity, then, we have a key to successful exploration and research, whether in peace or in war, in natural science or in social science, in government or in economics. With receptors alert to receive and the mind open to interpret, the way is opened to knowledge.

If to knowledge can be added wisdom, which combines discernment, discretion, and sagacity, we of the engineering and scientific group may take our place with confidence in the planning for the future, secure in the knowledge that we have a part to play and a contribution to make toward a new world order in which there shall be justice for all men.

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Liquid

BARNUM BEGAN IT

(*Continued from page 488*)

Though the attendance at many New York museums has dropped off in varying degrees during the war years, that of the Museum of Science and Industry has forged ahead 15 per cent as between 1941 and 1942. The Museum of Modern Art in New York City has also shown increased attendance, and again we find that a studied and persistent effort has been made to offer special exhibits, principally of war interest. (Incidentally, both the Museum of Science and Industry and the Museum of Modern Art charge an admission fee, whereas other museums of large attendance in New York City do not.) Though statistics regarding museum attendance are as difficult of analysis as any other sets of statistics, still it is perfectly apparent that the special exhibit, with its "newness" and its ability to answer a question, is an important factor.

The experience of the Boston Museum of Fine Arts during the war years is interesting and to the point: Attendance rose from slightly over 400,000 in 1938 and 1939 to 513,000 in 1941 and 546,000 in 1942. The authorities at this museum likewise attribute the increase to special exhibits, stressing highly successful showings of the Thorne miniature rooms in 1941 and 1942.

The arrival of peace, then, should find the museum well prepared, through its new outlook and its technical experimentation, to tell a dynamic story to a still-puzzled but jubilant and vitally interested public. If the opportunity is seized in time, before any reaction sets in, the museums may very likely capture a dominant place in the spreading of culture throughout our land — not culture in the academic sense but rather in the sense of understanding and feeling the mighty changes that have come over the world as well as those that are in the making. To exhibit the law of compensation actually functioning — that is a challenge. As, through applied science, there will never before have been such great destruction, so, through the same force, there will never before have been such great opportunity to rebuild well and wisely.

This challenge is no idle one. In McKinley's day, we heard the slogan of the "full dinner-pail," an appeal to the biochemical; in the 1920's, it was "two cars in every garage," an appeal to physical comfort. The signs point to something new, something better — and that is knowledge, or culture, a broader, richer horizon.

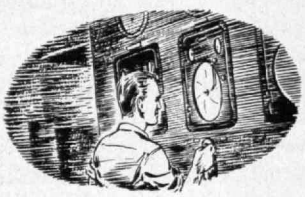
In speaking of "culture," one should distinguish between the meaning which refers to the daily life, the techniques, and the arts of a people and the meaning which refers to a cultivation and training of the mind, leading to an appreciation of all that is good in human endeavor and achievement. In the latter sense, the word is apt to be used in too limited a fashion, pointing merely to a self-centered, unworldly type of learning; this is an unfortunate tendency, for the culture of the mind, if the term is to retain anything of its former significance, implies breadth, completeness, and vitality.

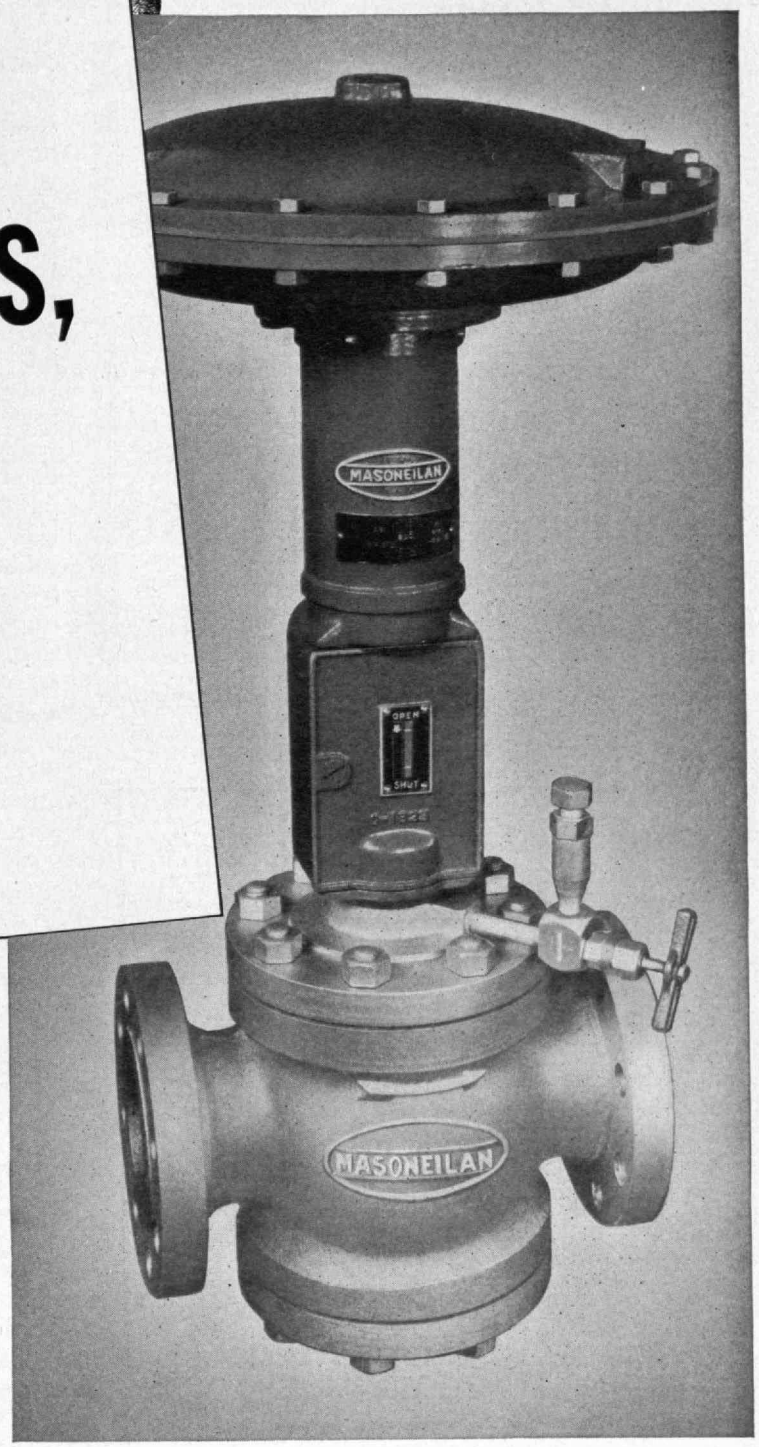
If one looks back to what the word "culture" meant to the educated gentlemen of the Renaissance, one is reassured. For though they delved deep into the lore of

(*Concluded on page 510*)

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BARNUM BEGAN IT

(*Concluded from page 508*)

antiquity and revived the thinking in the Greek and Latin manuscripts, they did so with a worldly purpose. The past was not dead to them; it was alive, very much alive, and it had a limitless value to all who should read. No doubt Hero of Alexandria, antiquity's first-rank gadgeteer, inspired Leonardo when the latter was designing "secret weapons" for his princely patron's army and was studying the bird's wing in an effort to work out theories of aerodynamics. Ptolemy the geographer, dead more than a thousand years, gave heart to Columbus and challenged Copernicus to produce something better. Vitruvius of Rome was studied not for his own sake but for practical ideas on architecture and building construction which could be used for the then modern palaces and cathedrals. Culture to the Renaissance was a bootstrap. It was a living force, open to all, used for all.

We have heard much in the immediate past about the great danger that the leveling effect of democracy is downward and that culture suffers thereby. We have heard much, too, about the danger that the mechanical side of the age has a similar lowering effect. It is also frequently said that no broad, synthetic understanding can exist in the present advanced state of our civilization, with all its complications, inconsistencies, follies, and triumphs, and that whoever tries to grasp the age and make sense out of it is per se a crackpot. It is true — too true — that brand-new problems face us, that revaluations aplenty are in store. Surely the war and its aftermath are providing a break, a shake-up, the beginning of something new. Knowledge and understanding must be the foundation, and the thirst for knowledge and understanding does exist. To teach and to guide are functions of the museum. Hence, in its own sphere of action, the contributions that the museum can make, capitalizing on its experience in exhibition techniques and in democratization, will be of definite importance.

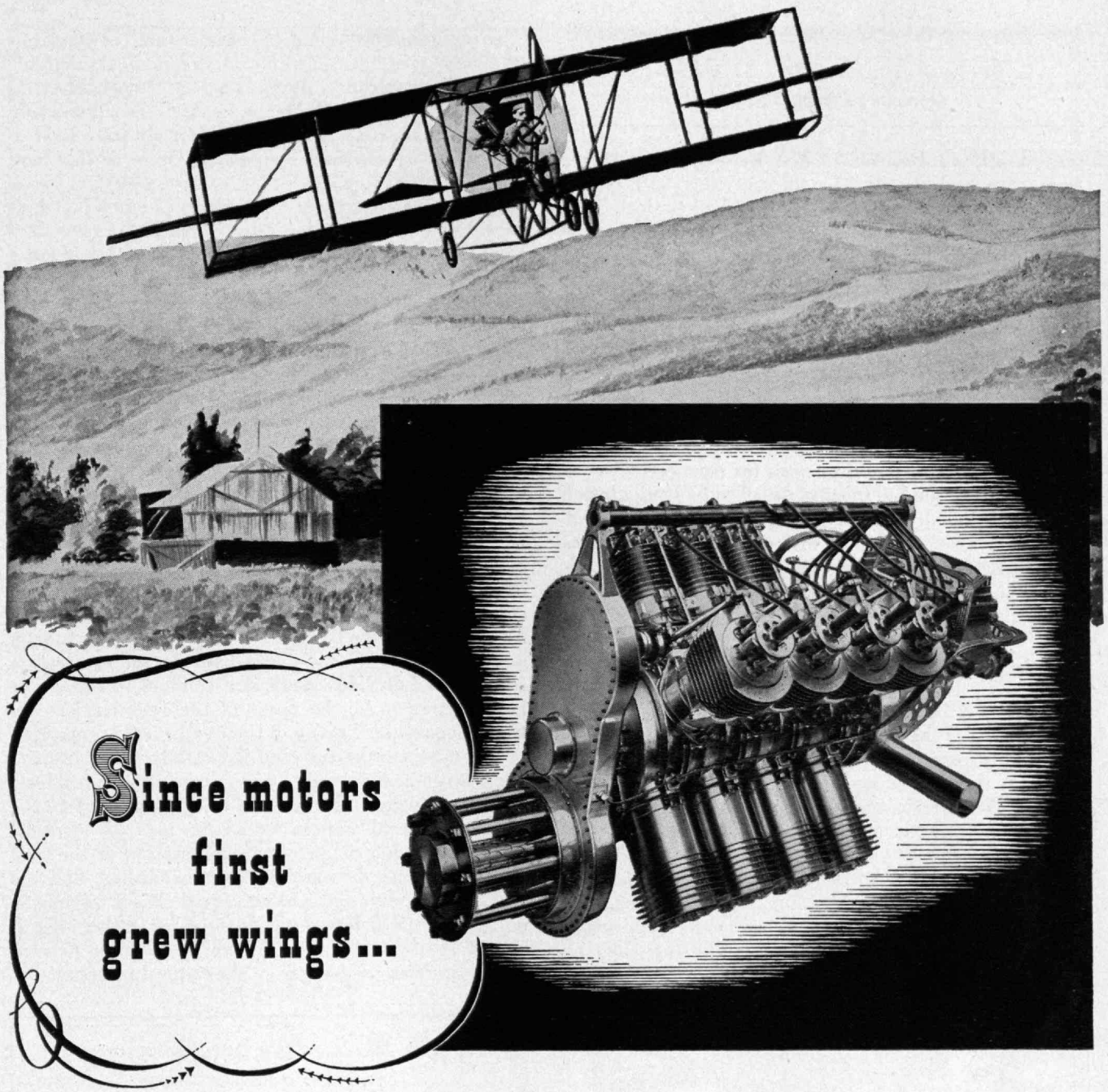
THE TREND OF AFFAIRS

(*Continued from page 480*)

journalists of today, chafing at the impracticability of reporting lesser matters, will suspect that Mr. Kelly's thoroughness in reciting the sad tale was a pleasant expiation of the fact that concerning the journalistic standoffishness of 1903 he can say a rueful "quorum pars fui." And there is, of course, some consolation to newsmen in the fact that the Army itself was none too alive to what had happened at Kitty Hawk.

The other more notable quality of Mr. Kelly's narrative is implicit: his comprehension and clear constant suggestion of the attitude of the Wright brothers toward each other, toward their work, and toward the world. These brothers who could argue long hours about the theory of their undertaking, until each had argued himself into the other's original position, constituted a research team in the best sense of the words. Their mutual

(*Concluded on page 512*)



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THE TREND OF AFFAIRS

(*Concluded from page 510*)

respect and self-respect, as Mr. Kelly presents them, were matched by respect for the materials, both physical and intellectual, with which they had to deal. This latter characteristic appears sharply in the singleness of purpose with which they worked upon the problem of flight during their available time and in the equally direct readiness with which they turned away from it to resume the earning of a living to make possible a resumption of the project. Through shrewd selection and straightforward presentation of detail, Mr. Kelly gives interesting insight into the personality of the two central figures in the drama.

Questions remain, however. Even in an age of such speed as our own, time must pass for perspective to be gained and for the full mass of detail to be straightened out and classified. *The Wright Brothers* is to be regarded as an able assistant to the historian in time to come. For the reader in the present, it is a friendly and informative way of coming to know two unassuming men who did a great thing.

Biotin

PERHAPS all plants and animals are ultimately made out of the same kind of mud. In any event, it is biologically interesting that a growth-stimulating factor for yeast (biotin), a growth and respiration factor in root-nodule bacteria of legumes (coenzyme R), and an antidermatitis factor in rats, chicks, and other animals (vitamin H) should all prove to be one and the same thing. We now call them all "biotin," and thanks to a considerable number of investigators in various laboratories the structure of the substance is quite completely known. Even more recently it has been entirely synthesized.

It is perhaps not unfair to consider that the synthesis of a substance like biotin has at the moment a largely academic significance. Biotin is a very remarkable vitamin in that it is one of the few essential nutritional substances which are not obtained primarily from food or apparently synthesized by man. In spite of this fact, under any ordinary conditions we have plenty of biotin to waste. We eject three to six times as much biotin as we get in our food. Indeed, determination of the nutritional significance of biotin has been a matter of some difficulty because the substance is so readily obtained by the body from the vast number of bacteria which we have always by us in the lower intestine.

Experiments on the significance of biotin to the human being have shown, for one thing, that a deficiency of biotin in children gives symptoms of dermatitis resembling those found in rats under similar conditions, while in adults the lack of biotin has been found to produce a fine, scaly dermatitis which disappears spontaneously after a time and is later succeeded by a gray pallor. These symptoms are accompanied by depression and lassitude as noticed in thiamine deficiency.

In their amounts of biotin, the tissues of embryos have been found to differ from the same tissues in the adult. This fact has led to an investigation which quite recently has shown that, in their biotin content, tumors and embryonic tissues deviate in the same direction from the adult. This result is a comfort to those who hold tumors to be the result of the activities of cells that have retained many of their embryonic properties.

The synthetic biotin which has lately been obtained has been shown, not only by physical and chemical tests but by biological tests as well, to be equivalent to the natural material and, as far as can be told, identical with it. The full detail of the preparation of the synthetic substance has not yet been published, and the real significance of the synthesis is not that it will enable us to obtain our biotin in pill form but rather that it proves the chemical structure which had been derived for biotin from an analysis of the natural material.




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THE INSTITUTE GAZETTE

(Concluded from page 495)

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Appointments

SINCE the announcement of the annual Faculty changes in May, three additional members of the staff have been promoted to the grade of assistant professor. They are John W. Irvine, Jr., '39, Department of Chemistry; William C. Bauer, '41, director, Parlin station, and James D. McNitt, '41, director, Bangor station, School of Chemical Engineering Practice.

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CAMBRIDGE, MASS.

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TECHNOLOGY MEN IN ACTION

THE ALUMNI FUND—ITS PROBLEMS AND GROWTH

CURVES—RED, GREEN, AND BLACK

CURVES and charts and graphs are pretty things, especially when they're made in many different colors, and more especially when they go in the right direction. We keep quite a number in the Fund office, and they have never failed to be eminently satisfying on both scores.

For example, there's one in red and green and black showing how many Alumni have contributed to the Fund this year in comparison with last year. An unfortunate accident left a blot of green ink in one corner, but that doesn't detract a bit from the satisfaction of seeing the black line (this year) constantly pulling ahead of the red one (last year). And then there's another showing the total amount. No mistakes on this one yet, and by the first of June that black line had pulled ahead of the red one by more than $6,500.

Curves are impersonal things. They show that by the first of June, 3,781 Alumni had contributed $57,977.86 to the Fund in this, its fourth year. They show that both these figures were in excess of last year's at the same time. What they do *not* show, however, is the spirit, the loyalty, the enthusiasm — even the sacrifice — that went to make those little red and green and black lines possible. Some indication of this human side of the Fund is in our files. There is the letter which reads: "Since my husband is on foreign service, I do not know how much he would like to give, but I trust this will be satisfactory." And another: "Last year I was a private in the Marines and could not give very much, but now that I have received my commission I can do a little better." Or the one from an Alumnus who contributed most generously: "I am known as a Tech man and as such gain much and suffer little in any company. As Tech men we may be overrated but never underrated, which certainly ought to be worth a small donation per annum."

Yes, it's fun to watch those curves shoot up, but the real satisfaction comes in an appreciation of the spirit of which they are such an impersonal manifestation. Technology is grateful for the financial assistance of its Alumni, but even more so for the splendid loyalty which that assistance expresses.

TECHNOLOGY CLUB STANDINGS

As the second month of the 1943–1944 Fund comes to a close, the race between the Clubs took a new turn. A dark horse from Rhode Island leaped to the fore and took the lead away from the Philadelphia entry — by a scant 1 per cent! Hardly even a nose. Philadelphia still has the largest total both in number of contributors and in amount, however. Cincinnati passed two other entrants to better its position, and all but two of the Clubs are leading the general average in per cent of contributors.

There's a whole summer ahead of us. By next fall there'll be other changes. Here's the way the Clubs stood on May 31:

	*Per cent of Contributors**	*Average Contribution*
Rhode Island	33	$13.20
Philadelphia	32	20.50
Western Pennsylvania	30	15.75
Northern New Jersey	22	12.80
Cincinnati	16	9.60
Central Pennsylvania	12	11.30
Buffalo	11	25.00
Dallas	8	10.40
Alumni Body as a whole	11	15.40

* *Based on number of active members.*

TECHNOLOGY MEN IN ACTION

M.I.T. MEN AT WAR

Up to June 8 over 4,500 Institute Alumni, including 15 Admirals and 53 Generals, were recorded as being in the active military or naval services of the United Nations. New additions this month included Brigadier General Aaron Bradshaw, Jr., '20, and Brigadier General Ludson D. Worsham '21. There were 23 Alumni who had already been officially decorated.

Additions and corrections to the listings which have previously appeared, beginning with the issue of November, 1942, will continue to be published in future issues of The Review. As a matter of convenience, promotions and corrections in the rank previously given are grouped under a single heading, "Changes in Rank." The Review Editors are greatly indebted to the many Alumni and other readers who are continuing to co-operate so helpfully in reporting inevitable errors of omission and commission which they note in these listings.

NEW DECORATIONS

1923 Randall, Russell E., *Brig. Gen.*, U.S.A., Air Medal for disregard of personal safety in Caribbean area.

1934 Robinson, James M., *Lt. Comdr.*, U.S.N., Distinguished Service Medal.

1940 Pieczentkowski, Herman A., *Lt. Comdr.*, U.S.N., Navy Cross.

Zeamer, Jay, Jr., *Capt.*, U.S.A., Silver Star by Lieutenant General George C. Kenney '11, for action over Rabaul in South Pacific.

1941 Blake, Robert W., Jr., *Capt.*, U.S.A., Purple Heart, North Africa.

Crowley, Thomas T., *Lt.*, U.S.A., Silver Star for gallantry in action in North Africa.

NEW LISTINGS

U.S.A.

1917 Ames, Norman B., *Col.*
1918 Franklin, Stanley H., *Capt.*
1919 Palmer, Russell S., *Corp.*
1922 Bradley, Maurice B., *Maj.*
Goucher, Charles L., *T/5*
1923 Davis, Walton T., *Capt.*
1924 Massari, Silvio C., *Capt.*
1925 Giblin, Charles A., *Lt.*
Mabley, Carlton R., Jr., *Maj.*
Williams, Henry W., *Lt. Col.*
1926 Jacob, John B., *Lt. Col.*
1928 Anderson, Charles M., *Lt.*
Harvey, Percy E., *Lt.*
1929 Goldsmith, Lloyd T., *Lt.*
1930 Caffey, William H., Jr., *Pvt.*
Hill, Edwin V., *Maj.*
Houston, George M., Jr., *Corp.*
Hughes, Daniel J., *Maj.*
1931 Dunklee, Donald L., *S/Sgt.*
Graham, Eliot S., *Lt.*
1932 Metcalf, Arthur G. B., *Capt.*
1933 Huston, Wilber B., *Pvt.*
Sterner, John, *Capt.*
Taul, Horace W., *Capt.*
1934 Allen, Robert F., *Pvt.*
Balleisen, Charles E., *Maj.*
Barry, William T., Jr., *Sgt.*
1936 Blanchard, Malcolm, *Lt.*
1937 Ficke, Stanhope B., *Capt.*
Moore, Leo B., *Capt.*
Shea, Jonas, *Corp.*
1938 Flanagan, Robert, *Lt.*
1939 Coogan, George J., *Lt.*
1940 Blackmer, Gordon W., *Sgt.*
Borg, Milton H., *Pvt.*
Enos, John E., *Pvt.*
Hayes, Robert L., *2d Lt.*
Simpson, Willard E., Jr., *Lt.*
Wampler, Charles E., *Capt.*
1941 Ackerson, Everett R., *2d Lt.*
Bourne, Holbrook A., *Lt.*
Holley, James J., *A/C*
1942 Candy, William R., *Lt.*
Cannon, Geoffrey R., *Pvt.*
Elmdahl, Ben A., *A/C*
Gannon, Richard X., *2d Lt.*
Hickman, Robert G., *A/C*
Lemaire, Henry, *Lt.*
Molo, William L., *Capt.*
Rothschild, Jacquard H., *Col.*
1943 Bierly, George W.
Courshon, Jacob B., Jr., *Cadet*
Crocker, Gage H., *Cadet*
Cruckshank, Ira G., *2d Lt.*
Heller, Steven
Horst, Bruce E.
Hosley, Loring F., Jr.
Hubbard, Merton R., *2d Lt.*
Ingham, James D., *2d Lt.*
Johnson, James H.
Kapstein, Seymour C., *2d Lt.*
Karnuth, Arthur E.
Lacy, William R., *2d Lt.*
Laird, William M., *Cadet*
Libbey, W. Scott, Jr., *2d Lt.*
Lustik, John
Mabbett, Franklin D., *2d Lt.*
McMullin, John G., *2d Lt.*
Malloch, James A., Jr.
Mestier, Arthur J., Jr., *2d Lt.*
Miller, Robert A., *2d Lt.*
Milman, Alan M.
Netsch, Walter A., Jr., *Pvt.*
O'Neill, William O., *2d Lt.*
Perry, Frederick G., Jr.
Porosky, Stanley M., *Lt.*
Reese, Jack W.
Richards, Raymond R., *2d Lt.*
Rumsey, Robert B., *Cadet*
Schwartz, Louis D., Jr.
Schwarzmann, Warren A., *2d Lt.*
Sewell, John M.
Shaknov, Irving, *2d Lt.*
Shoffner, Myron A., *Cadet*
Spear, Ernest M., *A/C*
Spencer, John H., *2d Lt.*
Stephens, Marvin C., *A/C*
Swanberg, Edmund R., *2d Lt.*
Terry, William B., *2d Lt.*
Wadsworth, Francis J., *2d Lt.*
Walcott, Henry R., Jr., *2d Lt.*
Walz, Hans G., *Corp.*

U.S.N.

1917 Whitney, Richard T., *Lt. Comdr.*
1919 Hall, Roger T., *Comdr.*
1920 Howard, Edward M., *Lt. Comdr.*
1921 Owens, George F. B., *Lt. Comdr.*
1922 Kroog, Alfred J., *Lt.*
1923 Gray, John L., *Lt.*
Gray, William C., *Lt. Comdr.*
King, Harvey M., *Lt.*
Morgan, Jasper, *Lt.*
1925 Bawden, Harold E., *Lt.*
1926 Wallace, Alexander C.
1927 Blake, Walter F., *Lt.*
O'Donovan, Richard L., *Lt.*
1928 Ellison, Huyler B., *Lt. (j.g.)*
Hurlbut, Terry A., *Lt.*
1930 Luykx, Henrik M. C., *Lt.*
Vanderwarker, Carlton E., *Lt. (j.g.)*
1931 Stewart, William B., *Lt. (j.g.)*
1932 Baker, George, *Lt.*
Smith, George H., *Lt.*
1933 Backus, W. Clinton, *Lt.*
1935 Bradshaw, John A., *Lt. (j.g.)*
deRoode, Albert, Jr., *Lt. (j.g.)*
1936 Hastings, Joseph M., *Lt. (j.g.)*
Taylor, Wilson A., Jr., *Lt.*
1937 Austin, William H., *Lt. (j.g.)*
1938 Bergseth, Frederick R., *Lt. (j.g.)*
Lebow, Ralph H., *Ens.*
Oakes, Thomas B., *Ens.*
1939 Sexauer, Benjamin H., *Lt. (j.g.)*
1940 DiVenuti, Lawrence E., *Ens.*
Fisher, J. Herschel, *Ens.*
Owens, Joseph F., Jr., *Ens.*
1941 Butler, Frank J., *Ens.*
Conner, Joshua C., Jr., *Ens.*
Duffy, Ben K., *Ens.*
Sipsey, Everett T., *Ens.*
Willey, Walter D.
1942 Beckley, Lawrence E., *Ens.*
Cavey, Edward C., Jr., *Ens.*
Dach, Arnold A., *Ens.*
Fox, Walter E., *Lt. (j.g.)*
Hakan, Barton L., *Lt. (j.g.)*
Miller, Roy R., *Lt. (j.g.)*
Rothery, John L., *Ens.*
Sandt, Robert E., *Ens.*
1943 Alschuler, John H., *Ens.*
Atlas, Sid F., *Ens.*
Azarigian, Gregory J., *Ens.*
Billings, Guy, *Ens.*
Bowers, Dexter K., *Ens.*
Boyd, Walter A., Jr., *Ens.*
Brindis, Bernard, *Ens.*
Brodie, Alvin C., *Ens.*
Bullerjahn, Eduard H., *Ens.*
Czar, Edward J., *Mid.*
Davis, Waldo F., Jr., *Mid.*
Eisenberg, Eugene R., *Ens.*
Engels, William V., *Ens.*
Fenton, Douglas G., *Mid.*
Fifield, Haven G., *Ens.*
Frankel, Raymond F., Jr., *Ens.*
Gershenow, Harold J., *Ens.*
Gluck, Simon E., *Ens.*
Goodfriend, Morton J., *Ens.*
Goodhue, James W., *Ens.*
Greenwald, Sidney F., *Ens.*
Henning, Richard E., *Ens.*
Horton, William H., *Ens.*
Hoyt, Edmund D., *Mid.*
Jarman, James F., *Ens.*
Jorgensen, Robert E., *Ens.*
Kaneb, Wilfred, *Ens.*
Karstrom, John O., Jr., *Ens.*
Lenzner, Israel Z.
Lord, Edwin R., *Mid.*
Maxwell, Robert W., *Ens.*
Peterson, John, *Ens.*
Prival, Elliott C., *Ens.*
Rosoff, Harold D., *Ens.*
Rouffa, Robert S., *Ens.*
Scott, Howard H.
Spears, Morton F., *Ens.*
Speicher, Paul E., Jr., *Ens.*
Spitz, Seymour J., Jr., *Ens.*
Stewart, Lawrence E., *Seaman*
Sutton, Walter G., Jr., *Ens.*
Theriault, George H., *Ens.*
Thoerle, John A., Jr., *Ens.*
Thomas, Torrence R., *Ens.*
Twaddle, Herbert G., *Ens.*
Van Burgh, Lisle, *Ens.*
Wadge, Gordon F., *Ens.*
Walker, Malcolm C., *Mid.*

U.S.C.G.

1934 Elliott, Royal A., *Carpenter's Mate 2/c*

U.S.M.C.

1943 Cochran, William J., *2d Lt.*

Canadian Army

1934 Williams, Edwin L., *Capt.*

Cuban Navy

1923 Cadenas, Felipe E., *Lt. Comdr.*

CHANGES IN RANK

U.S.A.

1907 Wilkins, Harold S., *Lt. Col. to Col.*
1912 Buie, Wilson R., *Maj.* to *Lt. Col.*
Levine, Max, *Maj.* to *Lt Col.*
1914 Salisbury, Ralph D., *Maj.* to *Lt. Col.*
1916 Brest, Alexander, *Maj.* to *Lt. Col.*
1917 Harrington, Walter, *Capt.* to *Maj.*
Proctor, J. Worthen, *Lt. Co.* to *Col.*
Williamson, Herbert C., *Maj.* to *Lt. Col.*
1920 Bradshaw, Aaron, Jr., *Col.* to *Brig. Gen.*
Kahn, Harry J., *Lt.* to *Capt.*
Owen, Frank S., *Capt.* to *Maj.*
1921 Bartlett, Boyd W., *Maj.* to *Lt. Col.*
Card, Thomas B., *Maj.* to *Lt. Col.*
Newcomer, David A., *Lt. Col.* to *Col.*
Worsham, Ludson D., *Col.* to *Brig. Gen.*
1922 Peabody, Elliott G., *Lt.* to *Capt.*
Silverman, Abraham G., *Lt. Col.* to *Col.*
Speir, Godfrey B., *Capt.* to *Maj.*
Winningstad, Olaf P., *Lt. Col.* to *Col.*
1923 Richards, Walter E., *Lt. Col.* to *Col.*
1924 Bailey, Harry C., *Maj.* to *Lt. Col.*
Feagin, Lawrence B., *Lt. Col.* to *Col.*
Maynard, Perry C., *Maj.* to *Lt. Col.*
Rosseau, Francis V., *Maj.* to *Lt. Col.*
Swicegood, Harry L., *Capt.* to *Lt. Col.*
1925 Gilliland, William L., *Lt.* to *Maj.*
Parkinson, Roger W., *Maj.* to *Lt. Col.*
1926 Baird, Arthur R., *Maj.* to *Lt. Col.*
Johnson, Richard W., *2d Lt.* to *Lt.*
Spence, John W., *Lt.* to *Capt.*
Staples, Elton E., *Capt.* to *Maj.*
1927 Ivancich, Paul N., *Maj.* to *Lt. Col.*
James, Maurice D., *Lt.* to *Maj.*
MacAdam, Lloyd R., *Maj.* to *Lt. Col.*
Payne, Lester E., *Maj.* to *Lt. Col.*
Waugh, Sidney B., *Lt.* to *Capt.*
1928 Cunningham, James C., *Capt.* to *Maj.*
Gorfinkle, William I., *Lt.* to *Capt.*
Sweeney, Francis C., *Capt.* to *Maj.*
Wilhite, Richard D., *Capt.* to *Maj.*
1929 Baum, Seymour A., *Maj.* to *Lt. Col.*
Darragh, Alexander L. H., *Lt.* to *Capt.*
Hardwick, Sydney C., *Lt.* to *Capt.*
Lucey, John F., *Maj.* to *Lt. Col.*
Perkins, Edwin H., *Lt.* to *Capt.*
Simon, Leslie E., *Capt.* to *Col.*
1930 Appleton, Ralph L., *Capt.* to *Maj.*
Bohorfoush, Joseph G., *Lt.* to *Maj.*
Devenbeck, Floyd C., *Lt. Col.* to *Col.*
Houston, D. Tullis, *Lt.* to *Capt.*
Kennedy, E. Foster, *Lt.* to *Capt.*
McManus, Thomas K., *Lt.* to *Maj.*

Thomas, Jack V., *Maj.* to *Lt. Col.*
1931 Aillery, Marcel P., *Capt.* to *Maj.*
Ayres, Gilbert B., *Lt.* to *Capt.*
Bertolett, Arthur D., *Capt.* to *Maj.*
Clouser, Edward H., *Maj.* to *Lt. Col.*
Dewey, Franklin H., *Capt.* to *Maj.*
Elser, Fred J., *Capt.* to *Lt. Col.*
Fleming, Robert J., Jr., *Lt. Col.* to *Col.*
Ford, Horace S., Jr., *Capt.* to *Maj.*
Gawlowicz, Stephen C., *Lt.* to *Capt.*
Holler, Walker W., *Lt. Col.* to *Col.*
Mohr, Lawrence G., *Capt.* to *Maj.*
Oleksiw, J. Jerome, *Lt.* to *Maj.*
1932 Eliassen, Rolf, *Capt.* to *Maj.*
Etstein, Morris H., *Lt.* to *Capt.*
Foster, Willard H., *Capt.* to *Maj.*
Lambert, Samuel E., Jr., *2d Lt.* to *Lt.*
Renshaw, Clarence, Jr., *Lt. Col.* to *Col.*
Thayer, Charles M., *Lt.* to *Capt.*
1933 Barbour, William E., Jr., *Lt.* to *Capt.*
Coffey, Philip J., *Lt.* to *Capt.*
Dunbar, Oliver C., *Lt.* to *Capt.*
Gray, Alanson M., Jr., *Capt.* to *Maj.*
Hughes, George E., *Capt.* to *Maj.*
Isserlis, George H., *Lt.* to *Capt.*
King, John C., Jr., *Capt.* to *Maj.*
Parker, Peter, *Lt.* to *Capt.*
Roetting, Frederick C., *Capt.* to *Maj.*
Slattery, Thomas J., *Pvt.* to *2d Lt.*
1934 Brown, Winton, *Lt.* to *Capt.*
Dickson, M. Scott, *Capt.* to *Maj.*
Fidler, Harold A., *Lt.* to *Capt.*
Gahm, Irvin G., *Capt.* to *Maj.*
Harman, John J., Jr., *Capt.* to *Maj.*
Jacobson, Saul B., *Lt.* to *Capt.*
Jerome, Charles W., *Capt.* to *Maj.*
Joel, Samuel W., *Lt.* to *Capt.*
Joroff, Samuel, *Lt.* to *Capt.*
Quinn, Horace A., *Capt.* to *Col.*
Rettberg, Walter A., *Corp.* to *S/Sgt.*
Williams, Roger H., *Capt.* to *Maj.*
1935 Applegarth, A. Rufus, Jr., *Lt.* to *Capt.*
Bloomgarden, Barclay H., *Capt.* to *Maj.*
Burton, John R., Jr., *Maj.* to *Lt. Col.*
Dale, David W., *Pvt.* to *A/C*
Edgar, Edward C., *Lt.* to *Maj.*
Eshbaugh, Richard H., *Lt.* to *Capt.*
Holley, John S., *Lt.* to *Capt.*
Hunt, George H., *Lt.* to *Capt.*
Johnston, Philip P., *Capt.* to *Maj.*
Nolan, David J., Jr., *Pvt.* to *S/Sgt.*
Pflanz, Louis W., Jr., *Lt.* to *Capt.*
Shellenbarger, Marion W., *Lt.* to *Capt.*
Spinney, Robert W., *Lt.* to *Capt.*
Taylor, Donald F., *Lt.* to *Capt.*
Trichel, Gervais W., *Capt.* to *Col.*
1936 Bagnulo, Aldo H., *Capt.* to *Lt. Col.*
Brown, Stanley W., *Lt.* to *Capt.*
Carota, Arthur A., *Capt.* to *Maj.*
Carten, Frederick H., *Capt.* to *Maj.*
Creasy, William M., Jr., *Lt. Col.* to *Col.*
Davis, Elmer W. L., *Capt.* to *Maj.*
Gelbert, Lewis, *Lt.* to *Capt.*
Gilinson, Philip J., Jr., *Lt.* to *Capt.*
Kanters, Lawrence, *Lt.* to *Maj.*
Leary, James H., *Lt.* to *Capt.*
Musschoot, Albert, *Capt.* to *Maj.*
Prichard, William W., *Capt.* to *Maj.*
Stewart, James T., *Lt.* to *Maj.*
1937 Altman, Frederick J., *Lt.* to *Capt.*
Conforth, Charles W., *Capt.* to *Maj.*
Corman, Harry, *Lt.* to *Capt.*
Cowles, James R., *Lt.* to *Capt.*
Dreyer, Christian F., *Lt.* to *Lt. Col.*
Freiberg, James M., *Capt.* to *Maj.*
Morton, Robert D., *Lt.* to *Capt.*
Rosen, Leo, *Capt.* to *Maj.*
Stuart, Henry J., *Lt.* to *Capt.*
Villaflor, Gregory P., *Lt.* to *Capt.*
1938 Foss, Paul B., *Pvt.* to *Corp.*
Golden, Harold L., *Pvt.* to *T/5*
Gray, Edward, *Lt.* to *Lt. Col.*
Hayward, Murray H., *Corp.* to *Sgt/T*
Johnson, Walter A., *Lt.* to *Capt.*
Mehren, Bernard W., *Corp.* to *A/C*
Oldfield, Homer J., Jr., *Lt.* to *Capt.*
Powell, Grosvenor F., *Capt.* to *Lt. Col.*
Preece, William H. S., *Pvt.* to *S/Sgt.*
Thayer, Henry C., *Maj.* to *Lt. Col.*
White, L. Douglas, *Pvt.* to *Corp.*
1939 Diercks, Frederick O., *Lt.* to *Maj.*
Ferris, John A., *Lt.* to *Capt.*
Herzberg, Albert, *A/C* to *2d Lt.*
Jeffus, Charles J., *Maj.* to *Lt. Col.*
Johnston, Paul H., *Capt.* to *Col.*
Kirshner, Leo, *Sgt.* to *S/Sgt.*
Murphy, William A. Jr., *Lt.* to *Capt.*
Reed, Winthrop B., *Lt.* to *Capt.*
Stanton, Paul N., *Lt.* to *Capt.*
Warner, Wallace P., *Lt.* to *Capt.*
Wetterer, Charles S., *Lt.* to *Maj.*
1940 Bray, Joseph M., *Lt.* to *Capt.*
Brush, Edwin G., *Lt.* to *Capt.*
Clark, William L., *Lt.* to *Maj.*
Crater, William E., Jr., *Lt.* to *Capt.*
Ferullo, Harry A., *Pvt.* to *A/C*
Hale, Boyden H., *Lt.* to *Capt.*
Haywood, Oliver G., Jr., *Capt.* to *Lt. Col.*
James, Winfield, H., *2d Lt.* to *Lt.*
Millet, Ralph T., *Capt.* to *Maj.*
Morgenthaler, David T., *Lt.* to *Capt.*
Noonan, Frederick F., *Lt.* to *Capt.*
Ready, William P., *Lt.* to *Capt.*
Schneller, George O., *Pvt.* to *Corp.*
Schwiebert, Howard E., *Lt.* to *Capt.*
1941 Aborn, Gage N., *Lt.* to *Capt.*
Fajardo. Tirso G., *Capt.* to *Maj.*
Gill, Richard M., *Lt.* to *Capt.*
Gwaltney, Eugene C., Jr., *Pvt.* to *Lt.*
Hudson, Walter D., *Lt.* to *Capt.*
Hunt, Ralph M., *Lt.* to *Capt.*
Liener, Irvin E., *Sgt.* to *2d Lt.*
Lowell, Arthur L., *Lt.* to *Capt.*
Marsh, Kirke W., Jr., *Lt.* to *Capt.*
Ryan, James J., Jr., *A/C* to *Capt.*
Sawler, Richard G., *Corp.* to *S/Sgt.*
Thornton, James S., *Lt.* to *Capt.*
Walsh, Arthur G., *Lt.* to *Capt.*
1942 Anderson, John R., *2d Lt.* to *Lt.*
Baird, Warner G., Jr., *Lt.* to *Capt.*
Barber, Donn W., *2d Lt.* to *Lt.*
Fay, Richard, *A/C* to *2d Lt.*
Hecker, William F., *Lt.* to *Capt.*
Lippert, Gordon, *Lt.* to *Capt.*
Plummer, Arthur W., *Lt.* to *Capt.*
Sawyer, James H., Jr., *2d Lt.* to *Lt.*
Schoen, William C., *2d Lt.* to *Lt.*
Walk, William E., Jr., *Lt.* to *Capt.*

U.S.N.

1915 Slater, Nelson, *Lt. Comdr.* to *Comdr.*
1916 Patten, David L., *Lt. Comdr.* to *Comdr.*
1917 Mehaffey, William C., *Lt. Comdr.* to *Comdr.*
1918 Lacey, Henry R., *Comdr.* to *Capt.*
1920 Ellsberg, Edward, *Lt. Comdr.* to *Capt.*
Hitchcock, Russell S., *Comdr.* to *Capt.*
1921 Wallin, Homer N., *Lt. Comdr.* to *Capt.*
1922 Harrison, Lloyd, *Comdr.* to *Capt.*
Hayes, Ralph S., *Lt. Comdr.* to *Comdr.*
1923 Dowd, Wallace R., *Lt. Comdr.* to *Capt.*
Hague, Wesley M., *Comdr.* to *Capt.*
Tusler, Floyd A., *Comdr.* to *Capt.*
Wheelock, Charles D., *Lt. Comdr.* to *Capt.*
1925 Meader, Raymond B., *Lt. Comdr.* to *Comdr.*
1926 Dingley, Edward N., Jr., *Lt. Comdr.* to *Comdr.*
Schmidt, Eugene A., *Lt.* to *Lt. Comdr.*
1927 Donovan, Jerome F., Jr., *Comdr.* to *Capt.*
Eaton, Paul C., *Lt.* (*j.g.*) to *Lt.*
Halpine, Charles G., *Lt. Comdr.* to *Comdr.*
1928 Sherman, Wilson R., *Lt.* to *Lt. Comdr.*
Woodbury, Robert S., *Lt. Comdr.* to *Comdr.*
1929 Kindell, Nolan M., *Comdr.* to *Capt.*
1930 Pyne, Schuyler N., *Lt. Comdr.* to *Comdr.*
1931 Glover, Cato D., *Comdr.* to *Capt.*
1932 Stover, C. Jack, *Lt.* (*j.g.*) to *Lt.*
Welch, Joseph, Jr., *Lt.* (*j.g.*) to *Lt.*
1933 Burdick, Robert S., *Lt.* to *Lt. Comdr.*
Cory, George L., *Lt.* (*j.g.*) to *Lt.*
Morgan, Ivor N. R., *Ens.* to *Lt.*
Ragsdale, Edmund M., *Lt.* to *Comdr.*
Rubinstein, Bernard, *Lt.* (*j.g.*) to *Lt.*
1934 Burke, James H., *Lt.* (*j.g.*) to *Lt.*
Hiemenz, Herbert J., *Lt. to Lt. Comdr.*
Murdoch, Reginald G., *Ens.* to *Lt.*
Vangeli, Mario G., *Lt. Comdr.* to *Comdr.*
1935 Perkins, Robert E., *Lt.* to *Lt. Comdr.*
1937 Ewald, George W., *Ens.* to *Lt.*
Febiger, Christian C., *Lt.* (*j.g.*) to *Lt.*
Fitch, Conover, *Lt.* (*j.g.*) to *Lt.*
Kahn, Charles R., Jr., *Ens.* to *Lt.* (*j.g.*)
1938 Benson, James F., *Lt. to Lt. Comdr.*
Cross, Marion A., Jr., *Ens.* to *Lt.* (*j.g.*)
Wright, David A., *Lt.* (*j.g.*) to *Lt.*
1939 Batcheller, Edgar H., *Lt.* to *Lt. Comdr.*
Bradbury, Kent F., *Ens.* to *Lt.*
Hanson, Herman H., *Ens.* to *Lt.* (*j.g.*)
Howard, David S., Jr., *Ens.* to *Lt.* (*j.g.*)
Laubach, James H., Jr., *Ens.* to *Lt.*
1940 Biggart, James H., *Ens.* to *Lt.* (*j.g.*)
Bloom, L. Hurley, *Lt.* (*j.g.*) to *Lt.*
Brown, Richard C., *Ens.* to *Lt.* (*j.g.*)
Chase, Irving H., *Ens.* to *Lt.*
Follansbee, Dudley B., *Ens.* to *Lt.* (*j.g.*)
Harper, Robert S., *Ens.* to *Lt.*
Morgan, Philip C., Jr., *Ens.* to *Lt.*
White, William R., *Ens.* to *Lt.* (*j.g.*)
1941 Anderson, William G., *Lt.* (*j.g.*) to *Lt.*
Cumberledge, Arthur A., *Lt.* to *Lt. Comdr.*
Fernandez, Raymond C., *A/C* to *Lt.* (*j.g.*)
Hahn, Clifford H., *Ens.* to *Lt.* (*j.g.*)
Hancock, Robert E., Jr., *Ens.* to *Lt.* (*j.g.*)
Homack, Peter, *Ens.* to *Lt.*
Hustvedt, Erling H., *Ens.* to *Lt.* (*j.g.*)
James, Stephen W., *Ens.* to *Lt.* (*j.g.*)
Kling, Vincent G., *Ens.* to *Lt. Comdr.*
Lazarus, Richard A., *Ens.* to *Lt.* (*j.g.*)
Levy, Richard S., *Lt.* (*j.g.*) to *Lt.*
McClure, Harlan E., *Ens.* to *Lt.* (*j.g.*)
Markey, Richard A., Jr., *Lt.* (*j.g.*) to *Lt.*
Neighbours, James W., *Ens.* to *Lt.*
Rodin, Harry, *Lt.* (*j.g.*) to *Lt.*
Ruckner, Edward A., *Lt.* to *Lt. Comdr.*
Scott, Benjamin D., Jr., *Cadet* to *Ens.*
Sexton, Frank M. P., *Lt.* (*j.g.*) to *Lt.*
Skowronek, Lester J., *Lt.* (*j.g.*) to *Lt.*
Thompson, Robert S., *Lt.* (*j.g.*) to *Lt.*
Thurlow, David, *Lt.* (*j.g.*) to *Lt.*
1942 Abrahamson, Ernest P., *Lt.* to *Lt. Comdr.*
Carlson, Ralph L., *Ens.* to *Lt.* (*j.g.*)
Clarke, William N., *Ens.*, to *Lt.* (*j.g.*)
Curtis, Robert M., *Ens.* to *Lt.* (*j.g.*)
Curtis, Robert W., *Lt.* to *Lt. Comdr.*
Franklin, William R., *Lt.* to *Lt. Comdr.*
Frueh, Alfred J., Jr., *Ens.* to *Lt.* (*j.g.*)
Kotlier, Irving, *Ens.* to *Lt.* (*j.g.*)
Kotsch, William J., *Ens.* to *Lt.* (*j.g.*)
Leiserson, Charles F., *A/C* to *Ens.*
MacIlroy, Kenneth G., *Ens.* to *Lt.* (*j.g.*)
Morser, Calvin S., *Ens.* to *Lt.* (*j.g.*)
Pepper, Edward L., *Ens.* to *Lt.* (*j.g.*)
Slack, Leslie M., *Lt.* to *Lt. Comdr.*
Walker, Charles D., *Ens.* to *Lt.* (*j.g.*)
Williams, James, Jr., *Ens.* to *Lt.* (*j.g.*)

U.S.C.G.

1939 Sharp, Henry St.C., *Lt.* to *Lt. Comdr.*
1940 Colmar, Peter V., *Lt. Comdr.* to *Comdr.*
1941 Fabik, Theodore J., *Lt.* to *Lt. Comdr.*

U.S.M.C.

1924 Bartlett, Ralph W., Jr., *Pvt.* to *Sgt.*
1941 Barnard, Richard I., *Corp.* to *Lt.*

RANK NOT PREVIOUSLY PUBLISHED

1935 Campbell, Richard D., *Lt.* (*j.g.*), U.S.N.
1936 Saffer, Charles M., Jr., *Lt.* (*j.g.*), U.S.N.
1942 Kunz, Robert C., *Lt.*, U.S.A.
Moncada, Valdo V. J., *Lt.*, U.S.A.
Richardson, William N., *Lt.*, U.S.A.

CASUALTIES

1936 **Terry, Thomas A., Jr., *Lt.*, U.S.A.
1938 **Flanagan, Robert, *Lt.*, U.S.A.
1942 *Costello, Francis M., Jr., *Lt.*, U.S.A.
*Herman, Bradford K., *Lt.*, U.S.A.
*Klopp, Harold J., Ensign, U.S.N.

*Died in Service. **Wounded.

COMPARATIVE SCHOLASTIC STANDINGS OF FRATERNITY AND DORMITORY UNDERGRADUATE GROUPS AT M.I.T.

(as of end of First Term, 1942–43)

Comparative Standing (based on February '43 ratings)		*Increase over June '42*	*Increase over Feb. '42*
Fraternity Seniors	3.70	0.05	0.23
Dormitory Seniors	3.53	*0.21	0.01
Fraternity Juniors	3.22	0.04	0.07
Dormitory Juniors	3.47	0.22	0.25
Fraternity Sophomores	3.09	*0.10	0.08
Dormitory Sophomores	3.17	*0.09	*0.17
Fraternity Freshmen	3.17	0.20	0.13
Dormitory Freshmen	3.25	0.23	0.18
General Average (Fraternity)	3.25	0.01	0.11
General Average (Dormitory)	3.31	*0.05	0.00

FRATERNITY SCHOLASTIC STANDINGS

Comparative Standing of 24 Chapters (based on February '43 ratings)	*Increase over June '42*	*Increase over Feb. '42*	*Comparative Standing of 24 Chapters Over Previous Five-year Period*	*Comparative Standing of Freshmen of 24 Chapters Feb. '43*	*Comparison with Chapter Rating*
1. Kappa Sigma 3.53	0.05	0.17	1. Pi Lambda Phi	1. Sigma Alpha Mu 3.76	+0.30
2. Pi Lambda Phi 3.50	0.08	0.20	2. Sigma Alpha Mu	2. Kappa Sigma 3.66	+0.13
3. Sigma Alpha Mu 3.46	0.135	0.18	3. Kappa Sigma	3. Theta Delta Chi 3.54	+0.28
4. Alpha Tau Omega 3.45	0.09	0.073	4. Alpha Tau Omega	4. Sigma Nu 3.505	+0.075
				Pi Lambda Phi 3.505	+0.005
5. Sigma Nu 3.43	0.25	0.225	5. Phi Delta Theta	5. Phi Sigma Kappa 3.49	+0.15
6. Lambda Chi Alpha 3.41	0.28	0.38	6. Phi Gamma Delta	6. Phi Beta Epsilon 3.43	+0.254
7. Phi Delta Theta 3.407	*0.113	0.197	7. Sigma Alpha Epsilon	7. Chi Phi 3.29	−0.03
8. Delta Tau Delta 3.37	0.092	0.10	8. Sigma Nu	8. Delta Psi 3.27	+0.13
9. Phi Kappa Sigma 3.34	0.14	0.23	9. Theta Delta Chi	9. Delta Kappa Epsilon 3.26	+0.222
10. Chi Phi 3.32	0.10	0.82	10. Phi Kappa Sigma	10. Delta Tau Delta 3.24	−0.13
11. Sigma Alpha Epsilon 3.316	*0.014	0.156	11. Sigma Chi	11. Alpha Tau Omega 3.21	−0.24
12. Theta Delta Chi 3.26	*0.063	*0.08	12. Delta Upsilon	12. Phi Kappa 3.18	+0.28
General Average All Fraternity Men 3.25	0.01	0.11		General Average All Freshmen 3.18	
General Average All Undergraduates 3.23	*0.12	0.03		General Average All Fraternity Freshmen 3.17	
13. Sigma Chi 3.21	*0.03	0.13	13. Lambda Chi Alpha	13. Phi Delta Theta 3.15	−0.257
14. Theta Xi 3.18	*0.08	0.00	14. Phi Sigma Kappa	14. Sigma Alpha Epsilon 3.08	−0.236
15. Phi Beta Epsilon 3.176	0.146	0.226	15. Delta Tau Delta	15. Lambda Chi Alpha 3.07	−0.34
16. Delta Upsilon 3.15	*0.13	*0.16	16. Beta Theta Pi	16. Beta Theta Pi 3.05	−0.06
17. Delta Psi 3.14	0.29	0.30	17. Theta Chi	17. Sigma Chi 3.00	−0.21
18. Beta Theta Pi 3.11	*0.12	*0.04	18. Theta Xi	18. Phi Gamma Delta 2.95	−0.06
19. Phi Sigma Kappa 3.05	*0.38	*0.325	19. Phi Beta Epsilon	19. Theta Chi 2.91	−0.126
20. Phi Mu Delta 3.04	0.05	0.013	20. Phi Mu Delta	20. Theta Xi 2.89	−0.29
21. Delta Kappa Epsilon 3.038	0.338	0.378	21. Chi Phi	21. Delta Upsilon 2.86	−0.29
22. Theta Chi 3.036	*0.084	*0.071	22. Delta Psi	22. Phi Mu Delta 2.72	−0.28
23. Phi Gamma Delta 3.01	*0.24	*0.19	23. Delta Kappa Epsilon	23. Phi Sigma Kappa 2.34	−0.71
24. Phi Kappa 2.90	0.02	*0.18	24. Phi Kappa		

* Decrease

ALUMNI AND OFFICERS IN THE NEWS

Honor

¶ To WILLIAM D. COOLIDGE '96, who was awarded the Order of Merit of Chile for his many services to civilization.

¶ To HERMANN C. LYTHGOE '96, who was elected president of the National Association of Food and Drug Officials.

¶ To WALTER R. MACCORNACK '03, who was re-elected vice-president of the American Institute of Architects.

¶ To RAYMOND R. RIDGWAY '20, who was awarded the Jacob F. Schoellkopf Medal for 1943 by the western New York section of the American Chemical Society.

¶ To DANIEL NOCE '21, who has been appointed to the United States Army General Staff in the European theater. Brigadier General Noce is one of the Army's foremost landing operations specialists.

¶ To MARTIN J. BUERGER '24, who has been honored by having a bay named after him. Professor Buerger was with the MacMillan expedition which in 1937 explored the Frobisher Bay region of Baffin Island, north of Labrador. He discovered and explored a body of water on the southwest shore of Frobisher Bay. This will be known henceforth as Buerger Bay.

¶ To BENJAMIN S. KELSEY '28, a colonel in the Army Air Forces, who flew a fighter plane across the north Atlantic in a history-making mass ferry flight to deliver scores of planes to the fighting front.

¶ To RAYMOND D. DOUGLASS '31, who received the honorary degree of doctor of science from the University of Maine.

¶ To SIDNEY SPEIL '36, who was awarded the Young Author prize by the Electrochemical Society, for his paper on the experiments with Tennessee clay being conducted at the Norris laboratory.

¶ To R. DIXON SPEAS '40, who won first prize in a contest sponsored by the Air Transport Association for original research in flight operations. Mr. Speas won $250 for his design of a flight-plan analyzer and altitude selector.

¶ To GEORGE R. HARRISON, staff, who received the honorary degree of doctor of science from Northeastern University.

On the Platform

¶ SELSKAR M. GUNN '04, who addressed a meeting of the Savannah Health Center in May.

¶ ROBERT E. WILSON '16, who delivered the commencement address at the 122d graduation exercises of Colby College, which awarded Dr. Wilson the honorary degree of doctor of laws.

¶ PHILIP H. HATCH '21, who spoke on Diesel locomotives in freight and passenger train road service, at the May meeting of the Toronto Railway Club.

Academicians

¶ At the annual meeting of the American Academy of Arts and Sciences in Boston on May 12, BRADLEY DEWEY '09 and DONALD C. STOCKBARGER '19 were elected fellows. HUDSON HOAGLAND '24 is the society's recording secretary, and HORACE S. FORD, staff, the treasurer.

Fire Protection

¶ Technology Alumni played a prominent part in the 47th annual meeting of the National Fire Protection Association in Chicago in May. The purpose of the convention was to discuss essential measures to safeguard wartime production from fire hazards. HOVEY T. FREEMAN '16 is secretary-treasurer of the association.

ASA H. NUCKOLLS '05, chairman of the committee on hazardous chemicals and explosives, reported on the fire hazards connected with various chemicals which have come into common use in war production. ROBERT S. MOULTON '17 gave the feature address at the fire marshals' meeting. Mr. Moulton, who spoke on the lessons learned from the disastrous Cocoanut Grove fire in Boston in 1942, is technical secretary of the N.F.P.A. and the secretary of the committee on safety to life.

HORATIO L. BOND '23 was the principal speaker at the first general session of the meeting. Mr. Bond, who is chief engineer of the association, told of his recent trip to England, with a discussion of the importance of fire and fire protection in the war.

COLONEL ALFRED B. JOHNSON '23, Office of the Provost Marshal General, spoke on the War Department's internal security program at a closed session on Army and Navy fire protection. COLONEL CARL G. RICHMOND '11, RAYMOND E. WILSON '12, and MALCOLM S. BLAKE '25 led a discussion of practical problems met by inspectors in the field of fire-protection devices.

DEATHS

** Mentioned in class notes.*

¶ WILLIAM D. AUSTIN '76, May 26.
¶ ERNEST C. COLE '81, May 26.
¶ LYMAN SISE '85, May 27.*
¶ EDGAR A. FROST '86, March 28, 1942.
¶ WILLIAM R. THOMAS '87, January 8.*
¶ J. DELANO WOOD '89, January 19.*
¶ RICHARD B. SNOW '92, December 16.
¶ GEORGE A. NICHOLS '95, February 25.*
¶ HARRY S. GILMAN '96, May 8.*
¶ WILLIAM R. HEDGE '96, April 19.*
¶ STANLEY HOWLAND '96, September.
¶ HOMER P. INGELL '96, May 4.*
¶ HERBERT C. WALDO '96, February 18.
¶ FREDERICK H. WALKER '96, June 2.
¶ HERBERT L. COBB '98, January 24.
¶ SYLVESTER Q. CANNON '99, May 29.
¶ BROOKS FROTHINGHAM '99, February 15, 1942.*
¶ SUSAN SIGOURNEY HARRIMAN '99, October 25.*
¶ MERTON A. HOLMES '99, June 16, 1942.*
¶ LOUIS R. LEONARD '99, April 7, 1942.*
¶ HARRY H. HAMLEN '00, February 14.
¶ B. GOULD MACINTIRE '00, May 6.
¶ ROBERT ANDREW '01, June 10, 1942.*
¶ CHARLES W. BEVERSTOCK '03, March 13.*
¶ HARRY R. CROHURST '07, March 12.*
¶ JEREMIAH J. O'SULLIVAN '07, April 3.*
¶ HOWARD S. PALMER '07, May 4.*
¶ MERRILL J. KIMBALL '12, August, 1940.
¶ L. RICHARD BYRNE '16, April 12.
¶ GEORGE R. WHITE '18, May 25.
¶ FREDERIC A. BAKER '19, March 26.*
¶ HENRY J. HORN, JR., '22, April 9.*
¶ F. GURNEY FINE, JR., '26, May 4.*

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Technology Club of Central Ohio

The annual dinner meeting of the Club was held at the University Club of Columbus on Monday, May 10. There were 24 members and guests present. After an excellent dinner, the meeting was called to order by Leslie H. Marshall '18, President. The guest speaker, B. Alden Thresher '20, Director of Admissions at the Institute, was introduced by Honorary Secretary Clarence E. Richards '18.

Professor Thresher had with him two color films. One showed Technology as it looks today, and the other pictured boating activities on the Charles River in front of the Institute. The movies and Professor Thresher's comments were very interesting, and we hope that he will be able to come out this way again in the near future. — CHARLES J. WARD '15, *Secretary*, Bureau of Bridges, Ohio State Highway Department, Columbus, Ohio.

Technology Club of Northern Texas

The Club has renewed its monthly luncheon gatherings. Because of war activities, many Alumni have moved to Dallas recently. These luncheons provide an opportunity for the old-timers and the newcomers to get together and to learn what is going on among M.I.T. men in and around Dallas. No reservations are required for our informal Dutch-treat get-togethers, and all Technology men who live in the vicinity or who are passing through are cordially invited to attend. For additional information, call President Jonathan A. Noyes '12 or Secretary E. G. Senter, Jr., '17.

About 16 Alumni attended the first luncheon meeting, which was held at the Dallas Athletic Club on Saturday, March 20; the second gathering, at which seven Alumni were present, was held on Saturday, April 24; and 12 attended the third luncheon, held on May 29. — ERASMUS G. SENTER, JR., '17, *Secretary*, 210 Construction Building, Dallas, Texas.

M.I.T. Club of South Florida

The Club met on April 28 at the Towers Hotel in Miami. Many of the members were unable to be present because of war activities, but it was gratifying to find that many of the original gang were still available.

The principal speaker of the evening was Major Norman A. Imrie, lecturer and author. Major Imrie is currently stationed at the Army Air Forces Technical Training Command at Miami Beach. His wit and charm were apt channels for his message of deep conviction that forces of tyranny cannot successfully compete with those of courage, honor, and loyalty. Those present felt that it would be a pleasurable and worth-while experience to study under such a man as Major Imrie, who gives an impression of human tolerance as well as trained discipline.

The following newly elected officers presided at the meeting: Edward I. Mandell '21, President; Charles S. Symonds '35, Vice-president; and Clarence P. Thayer '23, Secretary-Treasurer. To the executive committee were also elected George Batcheller '10, Hiram N. Crichton '10, J. Coleman Jones '23, and G. Edward Sakrison '29.

Major Walter E. Merrill '13 of the Caribbean Defense Command staff of Colonel William E. R. Covell '23 continued his record of being a loyal and regular attendant at our meetings. Also present were a number of Technology fathers and the newly created women's auxiliary group.

The women's group, under the leadership of Mrs. Jack Wilkinson, was started in November for three main purposes: to open the homes of Alumni for the enjoyment of service men; to contact M.I.T. Alumni in the services and tell them of other Alumni stationed in the area; and to complete any unfinished business for the boys who are suddenly transferred. Fifteen women attended a joint dinner and business meeting with the main Club to make final arrangements for the formal beginning of the women's auxiliary. — CLARENCE P. THAYER '23, *Secretary*, 1760 Northwest 41st Street, Miami, Fla.

M.I.T. Club of Northern New Jersey

The eighth annual meeting of the Club was held on May 3 at the Newark Athletic Club. Over 100 Alumni gathered together to enjoy an evening of good fellowship. The usual banquet was omitted this year.

The meeting was opened by President Warren H. Dolben '30 at about 8:30 P.M. With the aid of a chart, Walter L. Wise, Jr., '34, Treasurer, explained our financial condition. The Club is still solvent despite the nondues-paying membership plan!

Max Burckett '21, chairman, was then asked to give the report of the nominating committee. The following are the officers nominated and elected for the coming year: Newman H. Drake '30, President; George A. Chutter '21, Vice-president; Ralph S. Wetsten '21, Secretary; Fred E. Kowarsky '21, Treasurer; Frank Maguire '17, director of scholarship activities.

The main program of the evening was turned over to George Chutter '21, master of ceremonies. He introduced H. E. Lobdell '17, Dean of Students at M.I.T. Lobby spoke eloquently on conditions at the Institute. A measure of war activity was given in these terms: The cost of war research at M.I.T. has risen from $200,000 a month in 1940 to $200,000 a week in 1943. — President Dolben presented the Club's annual award to Jack Keck '23 for his faithful services as membership chairman.

David O. Woodbury '21 gave a humorous biographical sketch of himself. — NEWTON S. FOSTER '28, *Secretary*, 15 East Pierrepont Avenue, Rutherford, N.J. JOHN M. KECK '23, *Membership Secretary*, 207 Bloomfield Avenue, Bloomfield, N.J.

Technology Club of New York

We are glad to report that the following Alumni have applied for club membership: Winfield I. McNeill '17, Vice-president of the General Aniline and Film Corporation, 230 Park Avenue, New York; Griffin Crafts '24, general manager of the J. W. Wilson Glass Company, Inc., 186 Franklin Street, New York; and Bernard Dale '43, 620 West 115th Street, New York.

On Wednesday, May 12, the Class of 1909 held one of their usual successful luncheons, under the chairmanship of Paul M. Wiswall, Class Secretary. — About 20 of the Class of 1924 turned out for their class luncheon. Francis Barrett, Class Secretary, was caught on one of his days in town. Among the guests present were George Dandrow '22 and Al Glassett '20.

The annual meeting of the Club and election of officers, the fifth annual golf tournament, and the Class of 1922 luncheon were on the June schedule. — WILLIAM D. NEUBERG '17, *Secretary*, 24 East 39th Street, New York, N.Y. WILLIAM L. KEPLINGER, JR., '24, *Publicity Committee*, care of Johns-Manville, 22 East 40th Street, New York, N.Y.

Technology Club of Philadelphia

The final meeting of the season was held on May 18. Once again, Ed Healy '23 our President, very kindly invited club members to be his guests at a smoker in the clubrooms of the Philadelphia Brewing Company. About 60 members availed themselves of our genial President's hospitality.

The regular business meeting was dispensed with, and three sound movies of general interest were shown. As the night was extremely hot, the guests quickly got down to the serious business of quaffing the cooling beverage for which our host's brewery is famous. During the festivities, an inspection trip through the brewery was conducted. Most of the guests were amazed at the extensive

equipment required for the manufacture of beer. — GEORGE T. LOGAN '29, *Secretary*, 1000 Chestnut Street, Philadelphia, Pa. HENRY F. DALEY '15, *Review Secretary*, B. F. Sturtevant Company, Cresmont and Haddon Avenues, Camden, N.J.

M.I.T. Club of Western Pennsylvania

The Club held a most entertaining meeting on May 5 at the Pittsburgh Athletic Association. Late in the afternoon, some of the more athletic members engaged in swimming and in volleyball, later joining the others for dinner.

Bridge Casselman '15 was originally scheduled to give a talk on pogonotomy (you'll have to look it up in a big dictionary), concerning which he has become an outstanding expert. At the last minute, unfortunately, he was called out of town, probably finding new fields to conquer.

All present served as substitute speakers. President Ralph Ferry '12 called on each to speak briefly about his own work. An astonishing diversity of employment and a most interesting series of specific tasks were revealed, from unheard-of developments in internal-combustion motive power to Amos and Andy figures in types of electrical power. It was an absolute confirmation of the old adage that what is close by is oftentimes more arresting and interesting than that which comes from afar. All agreed that the meeting was one of the most enjoyable we have had in some time.

Plans for the annual summer outing were discussed. Transportation difficulties present an added problem, so various plans were placed on the fire, trending toward bringing the mountain to Mohammed for a change. — FRED W. WATERMAN, JR., '25, *Secretary*, Carnegie-Illinois Steel Corporation, 1304 Carnegie Building, Pittsburgh, Pa. GILBERT N. REED '23, *Membership Secretary*, Westinghouse Electric and Manufacturing Company, 1210 Union Bank Building, Pittsburgh, Pa.

Washington Society of the M.I.T.

Following last year's precedent, the Society held an informal ladies' night in Barker Hall of the Y.W.C.A. on May 4. Our speaker was our First Lady, Mrs. Franklin D. Roosevelt, who gave an off-the-record talk on her British experiences. Mrs. Roosevelt gave a most interesting, informative, sincere, friendly talk, which was really appreciated by her audience for some 50 minutes. On the few occasions we found it possible to pull our gaze away from her and glance about the room, we noticed the intense interest and complete silence of the audience, and when she gave one of her contagious chuckles, the response was immediate.

No notes were taken, and we feel that we received a more complete story because the speech was strictly off the record. Mrs. Roosevelt raised the question of the effect that our lack of suffering and our freedom from the dangers which both our allies and enemies have faced might have on our thinking and on our consequent postwar co-operation or isolation. She made a strong, genuine, personal appeal, and our Society thanks her sincerely for her personal sacrifice in being present and the revealing thoughts she expressed. Unfortunately, Mrs. Roosevelt could not stay for dinner, as Madame Chiang Kai-shek was her house guest that evening.

The many members of the dinner committee are to be congratulated on the way in which each fulfilled his duties under rather difficult circumstances and with a capacity crowd.

The Society held its May meeting on the 26th in Barker Hall, Y.W.C.A., President Merton L. Emerson '04 presiding. Our guest speaker, Dr. Harvey M. Davis, President of Stevens Institute of Technology and director of research of the War Production Board, discussed most interestingly various phases of research that have great possibilities. As an example of how research that appears to have no commercial possibility later develops, he cited how Seibel, near the beginning of the last war, apologized for a thesis on certain rare gases found in Kansas, but later has spent his entire life's work on helium extraction from natural gas. Another example was the tailspin at the beginning of the last war. Dr. Davis told how a United States aviator brooded over four tailspin deaths in a two-week period, and studied over the possible causes and cures until he developed eight which he planned to try. He then deliberately went into a tailspin at 7,000 feet and pulled out when he had tried number five method of overcoming it. From that time on, the tailspin became an item of practice for all aviators instead of almost sure death.

Following the talk, Joseph Y. Houghton '26, chairman, reported on scholarship awards for the ensuing year. In addition to a regional scholarship, half-tuition freshman competitive awards were granted to eight local students, and Army-Navy scholarships to five. This was a most satisfactory outcome.

Our Treasurer, G. Donald Fife '24, reported a most satisfactory balance. Vice-president William K. MacMahon '22 reviewed the activities of the past season, citing the great increase in attendance over former years. Ed Merrill '09, chairman of the nominating committee, brought in the following slate, which was duly elected: President, Merton L. Emerson '04; Executive Vice-president, William K. MacMahon '22; Secretary, Frank W. Milliken '04; Assistant Secretary, Albert F. Bird '30; Treasurer, G. Donald Fife '24; and Assistant Treasurer, A. E. Beitzell '28. Other members of the executive committee include: Commander Oliver D. Colvin '24, John Nolen, Jr., '20, Colonel Maurice R. Scharff '09, and Robert K. Thulman '22. Proctor L. Dougherty '97 was unanimously elected an honorary member of the Society as a token of our appreciation for the interest and work he has devoted to it. — M. WALDO KEYES '28, *Retiring Secretary*, 6514 Brennon Lane, Chevy Chase, Md. FRANK W. MILLIKEN '04, *Secretary*, 613 North Greenwich Street, Falls Church, Va. ALBERT F. BIRD '30, *Assistant Secretary*, Bureau of Ships, Navy Yard, Washington, D.C. WILLIAM K. MACMAHON '22, *Review Secretary*, Rosslyn Gas Company, 3240 Wilson Boulevard, Arlington, Va.

CLASS NOTES

1883

As this is the 60th year since the graduation of the Class at the Rogers Building in Boston, it would seem that we should do something more than usual about our anniversary. There are, however, so few remaining members and associates who have been accustomed to attend reunions in recent years that it appears inadvisable to attempt a class reunion at Cambridge this year.

In place of a definite meeting of available classmates, the Secretary will request the members and associates who can be reached individually to send to him immediately accounts of their activities and experiences since our 55th reunion five years ago. These notes will be duly edited for publication in a future issue of The Review.

Perhaps the Secretary may be permitted to note with a certain pride the fact that he has been continued in the secretaryship by the Class for the entire 60 years. — HARVEY S. CHASE, *Secretary*, 431 Chase Avenue, Winter Park, Fla.

1885

Lyman Sise died on May 27. Another good classmate has thereby left us! Lyman was born on September 1, 1862. He was graduated from the School of Mechanic Arts in 1881. He entered M.I.T. that fall and spent two years specializing in chemistry and mining engineering. The next two years he was connected with the operation of a gold mine in California. He returned to Massachusetts and studied architecture in various offices, and from 1888 to 1927 he practised in this profession. In 1927, he said: "I was knocked out physically and had to retire from all work."

Lyman was a loyal member of our Class, and I think I am correct in saying that he attended every meeting up to 1942, when he was unable to come to the class luncheon. In spite of his lameness, he was always present at the funeral services of our classmates. He lived in West Medford, and such attendance must have been a great effort. All honor to him. — ARTHUR K. HUNT, *Secretary*, 145 Longwood Avenue, Brookline, Mass.

1887

The death of our classmate W. R. Thomas on January 8 was announced in the June class notes. Your Secretary is now able to furnish a sketch of his life and career, taken from the Pittsfield, Mass., *Berkshire Eagle* of January 9: "William Russell Thomas, 77, retired chief engineer of the E. D. Jones & Sons Company, manufacturers of paper mill

1887 Continued

machinery, died . . . at his home, 183 Bartlett Avenue. Mr. Thomas was born in Laconia, N.H., Nov. 20, 1865, son of Winfield S. and Mary Frances Russell Thomas. He graduated from the Chauncey Hall Preparatory School, Boston, and from Massachusetts Institute of Technology in 1887, as a mechanical engineer. At the Institute Mr. Thomas was a classmate of the late Edward A. Jones, son of Edward D. G. Jones, who founded the industry in this city.

"Soon after his graduation, Mr. Thomas came to Pittsfield as an engineer for the Jones Company and remained with it until his retirement in 1935, a period of about 47 years. While chief engineer for the company, Mr. Thomas was an important figure in the development of paper mills and paper mill machinery. He designed complete mills which were installed in several foreign countries, including China and Japan, as well as in leading paper manufacturing centers in the United States. He was widely recognized as a leader in his profession.

"Mr. Thomas was a founder of the First Church of Christ, Scientist, and served as its clerk and a director. He was prominent in the Masons, being a 32nd degree Mason, a past master of Crescent Lodge, and a member of Berkshire Commandery of Knights Templar. Since his retirement he has spent several winters at St. Petersburg, Fla. Survivors are his wife, the former Ida Andrews, and one sister, Mrs. George R. Todd of Boston."

Dick Schmidt had the great misfortune to slip and break his leg at his home in Chicago early in March, and as a result was confined to the house for a period of seven weeks. By May, he had improved enough to be able to get out and around again and to go to his office every day. — Fred Kendall, who has been suffering from arthritis for some time, appears to be improving. Lonsdale Green, who also suffers from the same complaint, spent a month or more at Hot Springs National Park, Ark. This gave him much relief. — We hope to be back again in November with more news from the fellows. — NATHANIEL T. VERY, *Secretary*, 15 Dearborn Street, Salem, Mass.

1888

On April 27, John W. Linzee wrote as follows: "My son, John W. Linzee, Jr., aged 22, is an ensign in the Navy's air force at Pensacola, Fla., and my youngest son, Thomas Edward Linzee, aged 20, is in the Army, training at Chicago, Ill. My daughter married Arthur Whittaker, LL.B. I have not heard from my English relatives, but I do not doubt that they are all in the Royal Army or Navy, as such was their intention a year or more ago."

On May 20, the day after my arrival on Chebeague Island, I received two magnificent gilt-edged volumes of 450 pages each, entitled *The History of the Linzee Family and the Penfold, Hood, Amory, Tilden, Hunt, Browne, Wooldridge, Evans Families*, by John W. Linzee. The books contain scores of fine portraits of his ancestors, including Captain John Linzee of the Royal Navy, his great-grandfather and the founder of the American branch of the family; and Admiral Robert Linzee and Admiral Samuel Hood Linzee, both of the Royal Navy. It is a remarkable record of a remarkable family.

After a long hard winter in Wayzata, Minn., Ted Foque writes: "Ellis is in New Hampshire making maple syrup. I have not heard from Eastman for a long time. I wrote him a short time ago, and if I get anything interesting from him, I'll pass it on. When it is not too cold, he works in his shop in the forenoon and reads in the afternoon. He says that he hates to write letters. If he would get a typewriter and keep up a correspondence with his friends, time would pass much faster. His legs are bad, and he anticipates that sooner or later he will not be able to navigate under his own power." — BERTRAND R. T. COLLINS, *Secretary*, Cheabeague Island, Maine. SANFORD E. THOMPSON, *Assistant Secretary*, The Thompson and Lichtner Company, Inc., 620 Newbury Street, Boston, Mass.

1889

From the Nashville *Tennesseean* of May 14, the Secretary gleaned the following news about one of our number, who with all his other interests finds time to be a victory gardener: "Few people in Nashville have not met 76-year-old B. F. Wilson, and thousands of persons over the United States and many in foreign countries know him. Every person who has visited the Parthenon has met him. He's never missed a day from his job because of sickness. A graduate of the Massachusetts Institute of Technology, Boston, he is a native of Williamsburg, Va., but has lived here since 1921. 'I haven't grown a garden in many years, but I'm the son of a small truck farmer,' he said. 'I'm eager to get started. Everybody's got to grow something this year.' Wilson perhaps knows as much about classic literature, art and history as any man in Nashville."

Clarence Norris' address is now 263 Blue Hills Parkway, Milton, Mass. — E. V. French has resigned as president of the Arkwright Mutual Fire Insurance Company and has been elected chairman of the board.

The Secretary has received notice of the death of J. Delano Wood at South Dartmouth, Mass., on January 19.

Because of the war situation, we have decided to omit this year the annual cocktail party which of late has been held every spring at the home of the Secretary. Next year will be our 55th anniversary and a suitable occasion for a gathering. Let us all hope to be present. — WALTER H. KILHAM, *Secretary*, 126 Newbury Street, Boston, Mass.

1892

A portrait of William R. Kales, painted by Harold Brett, has been presented to M.I.T. by Mrs. Kales. The Institute is pleased to have this beautiful lifelike picture of him. His service on the Corporation was highly valued. The Class should feel highly honored to have hung at Technology a portrait of our President.— CHARLES F. PARK, *Secretary*, Room 5–111, M.I.T., Cambridge, Mass.

1895

In order to correct our records, we advise that George A. Nichols of New York City passed away on February 25, not on February 26 as previously reported. Will the several chronologic statisticians of the Class please take notice. This correction was received from Mrs. Nichols through Fred B. Cutter '98.

It was really heartening to a distressed Secretary to read the following in the '96 class notes in the May Review: "It remains perforce for the Secretaries to divest themselves of their modesty and speak about themselves in order that this column may not be entirely barren." Your Secretary fully concurs with these views of Charles Locke. This is to warn you '95 lads that if you continue to be so close-fisted with your doings, you will be burdened shortly by reading an autobiography of Yoder, which will appear in The Review in serial form.

Now get busy boys, and tell us what is on your minds. Your Secretary will polish any information for these columns, if you give him the opportunity. — Andy Fuller drops me a line now and then; he is still in Boston and lives at the Hotel Myles Standish on Bay State Road. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass.

1896

Professor Elbridge C. Jacobs took a week end from his duties at the University of Vermont and visited Boston in connection with a meeting to deal with the mineral resources of New England. The Secretary was very happy to receive calls from him on the two successive days of May 7 and 8, and to get news of all the happenings of the winter in the north country.

At the meeting in Denver on May 26, H. C. Lythgoe was elected president of the National Association of Food and Drug Officials. — A further letter from Victor Shaw reports that he is now on his seasonal job of lookout man in the Angeles National Forest in California. His efforts to get into the present fight were unsuccessful because of a minor physical defect. His relations are doing their bit, however, as he has three nephews in the Pacific zone, another in England, and still another in North Africa. One of his nieces is in the WAAC, while another niece is a technical secretary in Navy headquarters in San Pedro, Calif. — Louis Marble in Cleveland says that he has been reading the class book with much interest and finds that it brings back a flood of recollections. After a slight setback in his health which kept him confined for about ten days last spring, he picked up and actually is now feeling more like himself than he has for several years.

Dan Bates has returned from his two months' trip through the West, which proved to be most pleasant and profita-

1896 Continued

ble. At the time these notes were written, the last of May, Rockwell and Damon were at Moosehead Lake in Maine for their annual date there with a fish. The ice was a little late in going out from the lake this year, but they were on the job immediately the ice disappeared, looking forward to a good catch of fish. On their way to Moosehead, they spent the night in Portland and reported a very pleasant evening with Robinson, who although retired from the New England Telephone and Telegraph Company has for the past year or more been on war work around Portland and has made his headquarters at the Eastland Hotel.

Frank Hersey has been elected vice-president of the South Boston Savings Bank, and his son, Frank, Jr., is a private at Camp Devens.

Architectural business being at a very low ebb all over the country has had its effect on some of our classmates. Last month we reported that John Ashton was still carrying on in Lawrence, Mass. Word has now come from Fred Ashley in Los Angeles that after 56 years he has retired. In March, 1887, he started as office boy with James G. Cutler, architect and inventor of the Cutler mail chute. Ashley and John C. Austin have been associated in architecture in Los Angeles for many years. Now that the office is being closed because there is practically no architectural work, and no building material to be had, except where government financed, Ashley is retiring to a large city lot on a hillside, where he plans to "putter" to his heart's content. Ashley called on Dr. Chenery recently in Los Angeles. Chenery has also written the Secretary to report that, although he loves the climate of Los Angeles, the problem of finding a suitable housekeeper has become increasingly difficult, so that he is letting his home in Los Angeles and is going to live with his sister and her husband on a pear-orchard ranch in the Rogue River Valley. His address from now on will be Dr. Winthrop H. Chenery, Route 1, Box 467, Medford, Ore.

Will Hedge's death was reported last month. Since then the Secretary has received a copy of the May issue of the "Accelerator," published by the Boston Insurance Company and the Old Colony Insurance Company. This gives the financial statement of these two insurance companies written by Will Hedge shortly before his death, and it also carries a speaking likeness and a fine obituary giving the high points of his career, and also dealing with his club associations and hobbies. At a special meeting of the board of directors of the two insurance companies held in Boston on April 27, his twin brother Henry, who had been vice-president of these companies for over 20 years, was elected to the office of president, which had become vacant by Will's death.

Our classmate Dr. Harry S. Gilman passed away in Wellesley Hills, Mass., on May 8, after an illness of four years. He was born in Manchester, Mass., on August 25, 1872, and married Lucilla S. Damon, who survives him, along with a daughter, Lucilla O. Gilman, born September 7, 1911. He attended the Berkeley Preparatory School and was with us at M.I.T. from 1891 to 1893, taking part in football and other activities. He then went to Harvard Dental College, from which he was graduated in 1896. He practised dentistry in Boston ever since graduation until he was forced to give up because of poor health. For a number of years he was an active member of the First Corps of Cadets. Many of us will remember well that it was at Harry's cottage on the shore at Ipswich that we held our first class reunion during the first week of June, 1906, as recounted in the class book.

Homer P. Ingell of our Class died in Swampscott on May 4. He was with us for four years in Course VI, although he was not graduated. His lifework was with the General Electric Company. He was born in Taunton, Mass., on October 7, 1871, and married on June 25, 1902, Florence L. Chace, who survives him, along with his son, Preston Ingell, and his daughter, Kathryn. He was active during the Spanish-American War on the fortification of Boston Harbor. Ingell retired from his position as engineer in the Lynn General Electric plant about ten years ago, but continued to live in his home at 3 Grant Road, Swampscott. He had been ill several months prior to his death. He was very prominent in various Masonic organizations, ranking as one of the leading Masons of Massachusetts. He was also a member of the Odd Fellows. — CHARLES E LOCKE, *Secretary*, Room 8–109, M.I.T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1899

Breaking a long silence, the Class of '99 will now take a bow. Two of our members have been much in the news the past few months: William S. Newell of the Bath Iron Works Corporation, Bath, Maine; and David C. Churchill, erstwhile of the Churchill Weavers, Berea, Ky., now associate aeronautical engineer, miscellaneous equipment branch, Wright Field, Dayton, Ohio. Doubtless others of our Class have been active in connection with war industries.

In March, Newell was appointed to the board of directors of Mack Trucks, Inc.; he is also a director of the Maine Central Railroad, the Bath Savings Institution, and the Union Mutual Life Insurance Company. He serves as a trustee of Colby College and the Webb Institute of Naval Architecture, and is active in the American branch of the Newcomen Society of England. The Bath Iron Works Corporation, of which he is president, has been building ships for Uncle Sam on both the East Coast and the West Coast. That story has been told in this column, and each month adds to its luster.

The Churchill Weavers, of which D. C. Churchill is president and business manager, like other small handicraft businesses was unable to compete with machine weaving, so Churchill took to making "long underwear" for planes for arctic service. In the *Saturday Evening Post* of April 17, the caption on a picture of one of the planes read: "Army Aircraft on the ground for an hour or so must put on its long underwear. Otherwise, frost crystals on lifting surfaces decrease lifting power and make take-offs sluggish."

Churchill tells it in his own words: "Last fall and summer I designed a wing cover especially intended to meet certain conditions found in Alaska. It is said to be the first cover designed in 13 years which met the four requirements demanded. It is lightweight, quickly detachable, form fitting and skintight, and it stands propeller wash at full gun — 500 to 600 miles per hour. The parabola was used along the edge as a means of obtaining a dead evenness of tension on the cloth. Avoiding 'peaks loads,' a four-ounce cloth is made to stand tension on the looped points as high, sometimes, as half a ton. It took some showing to prove that we could hang a ton weight to a piece of cheesecloth if we have enough cloth and a strong enough tape properly stitched to the edge. The cover weighs 94 pounds complete with ties, and we have not torn one yet even at full gun, whereas the former cover weighed 250 pounds and tore to ribbons at full gun.

"In December, I was asked to go to Alaska to follow up the cover and see how it did its stuff. The test performance was so satisfactory that my trip was called off, and we were told to produce, produce, and produce. By January 1, 30,000 covers had been finished for service. Now I have space for a laboratory, and am back doing research work and shall hope to make a really good cover for the Air Forces before next winter."

Wartime seems to be Churchill's opportunity. As I recall, he was in India in World War I, and there aided Great Britain by inventing a hand loom which did much for hand weaving in India. That story, too, has appeared in this column.

Gardner Barry writes from Sandwich, Mass., that he ran a wood-cutting marathon all winter. The wood burner, reinstated in the interest of conserving oil and coal, ate up a great deal of wood. Keeping up with the burner reduced Gardner's weight to 133 pounds from an unmentioned high, and his waist by a couple of notches in his belt. He reported feeling fine and fit. Gardner presented the flag of the Class to the Sandwich High School. Tommy Robinson was one of the designers of that building, and it seemed fitting that the flag should find shelter there. A courteous note of acceptance was received recently.

C. B. Cluff of Procter and Gamble Company's patent department, wrote in February from Wyoming, Ohio, that he had been quite ill for some months, but was then much improved and hoped to be back in the office by April. — From a clipping from a Boston newspaper, I have learned that Miles S. Sherrill, Professor of Chemistry at M.I.T., is to retire on July 1.

Haven Sawyer, who used to run a fox farm in Maine, is in Washington for the

1899 Continued

duration. I was out of town when he telephoned, but he left word that he was residing at Capitol Towers, 208 Massachusetts Avenue, Northeast. He is associated with the procurement committee of the Senate, and will be glad to hear from any member of '99 who gets to Washington.

It is with regret that I announce the passing of the following classmates: Brooks Frothingham on February 15, 1942; Susan Sigourney Harriman on October 25; Merton A. Holmes on June 16, 1942; and Louis R. Leonard on April 7, 1942. — W. MALCOLM CORSE, *Secretary*, Westmoreland Depot, N.H. ARTHUR H. BROWN, *Assistant Secretary*, 53 State Street, Boston, Mass.

1901

A note from Louis Williams, II, says that he is manager of the Detroit office of the Engineering Societies Personnel Service, which is controlled by the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers, and the American Institute of Mining and Metallurgical Engineers. He writes: "We are having a very interesting time trying to locate technical men for industry and for commissions in the armed forces. We have referred over 500 men for the latter. Our office is located in the Rackham Educational Memorial Building. If any of the boys are in Detroit, I wish they would look me up, as we have a building which is worth while seeing."

Carl Johnson, II, writes that he is wing commander with commission as a major in the Civil Air Patrol, in a Nevada wing which he organized about a year ago. He lives in Lake Tahoe, Nev., and the office of the organization is in Reno. Carl says: "We have trained many pilots and equipped many planes for coastal patrol and other active service. We have many crack-ups of Army planes in the rugged mountain area of Nevada, and probably our most essential duty lies in the search and rescue of planes and personnel. This requires a large trained ground force of mounted men, mechanized equipment, and personnel specially trained for work in the mountains and on the desert. We have been on many rescue missions. Pictures of our group in action have been shown in many newsreels all over the country. I have one son who was in the Marine Corps. He was injured at Pearl Harbor and spent some months in the naval hospital there and in Oakland, Calif. He has his discharge for disability and now works in Douglas Aircraft's Long Beach plant."

Fred Sexton, III, President of the Nova Scotia Technical College, Halifax, reports that he is regional director of the War Emergency Training Program. He says encouragingly: "For the last three years I have been spending spare time in organizing training in a broad range of trades for Army, Air Force, and Navy men, and for civilians who are entering war industries. The rate at which people can acquire technical knowledge and complicated mechanical skills when they are in dead earnest is amazing. If the emotional drives of war can be largely carried over into the peace, we can make a brave new world in a decade."

William Whipple, II, professor of steam engineering at Louisiana State University, Baton Rouge, sends in the following news: "King Knox, VI, publishes in Baton Rouge a newspaper called *Home News*. He puts it out at his own expense and sends copies free to every man in the armed services whose home is in Baton Rouge or vicinity. . . . I have three boys in the service: Commander Walter J. Whipple of the Navy; Lieutenant Colonel William Whipple, Jr., of the Army Corps of Engineers; and First Lieutenant J. Randolph Whipple of the Corps of Engineers."

Edward Beckwith, V, wrote: "For about a year, I have been one of a limited number of civilian instructors in air navigation at the naval air station in Pensacola, and so far I have instructed about 300 men. Subjects include celestial navigation, used mainly on transoceanic flights; scouting and search operations, used for shorter flights from land bases and carriers; and practical navigation, which includes many unrelated subjects."

Winthrop St. Clair, IV, President of Sturgis Associates, Inc., Boston, Mass., architects and engineers, has been on a leave of absence for the past year. He has been project manager in charge of construction of the naval air station at De Land, Fla. When that was completed, he was transferred to a similar station at Melbourne, Fla., to have charge of the completion of that project, and then he was appointed to the public works office and stationed at the Melbourne base.

Langdon Pearse, I, sanitary engineer of the sanitary district of Chicago, has been with the district since 1909. He is in charge of sanitary investigations, and has various duties in connection with planning, construction, and operation of sewage treatment works; industrial wastes; sale of heat-dried activated sludge for fertilizer; expert work; and so on. He is a life member of the American Society of Civil Engineers; the American Water Works Association, and the Boston Society of Civil Engineers.

We were glad to receive from Benjamin Miller, VI, an artist who lives in Cincinnati, the following account of his activities: "I followed the profession of engineering in Ohio and California for about five or six years after graduation. I then took up art — a profession I had always wished to pursue. I never regretted giving up engineering, but I have always been very grateful for the scientific education I received at M.I.T. I regret that I have not been able to keep abreast with science and mathematics. This year I am taking a course in geology at the University of Cincinnati. As for art, I am represented in the Bibliothèque Nationale, Paris; the Cincinnati Art Museum; the Minneapolis Institute of Art; and the New York Public Library. My work has been reproduced in the following books: *The Woodcut of Today at Home and Abroad*, *La Gravure Sur Bois Moderne de L'Occident*, *The New Woodcut*, *Ohio Art and Artists*, and *Wood Engraving of the 1930's*. I have exhibited extensively both in the United States and Europe."

William Pepperell, III, is director of purchase, engineering, and research for five large textile plants in North Carolina, South Carolina, and Virginia. His central office is in the Jefferson-Standard Life Insurance Building in Greensboro, N.C. He wrote: "These mills are all very modern — mostly new plants designed primarily for making yarns and weaving fabrics of rayon and other synthetic fibers, both of continuous filament and cut-staple form. These include blends with cotton, wool, and silk, and are used principally in three major groups of fabrics: dress goods, underwear, and linings for apparel use. The war has, however, caused us to convert our equipment to the making of war materials." The conversion of the mills to war production involved a tremendous amount of work for Bill and his departments, which also include construction and maintenance of plants.

Anthony Peters, I, writes that he is "in charge of the thermoplastic division of the Windram Manufacturing Company, South Boston, Mass., and operating on a royalty basis — coating fabrics with gums and resins. This is a far cry from civil engineering but it is extremely interesting, especially now that the supply of many natural gums and resins has been cut off. Each day offers new problems and complications in the substitution of synthetics."

We reported in the May Review that Mansfield Estabrook was ill. On April 15, he wrote us a note from the Phillips House of the Massachusetts General Hospital. He said: "For most of 1942, I was with the tools branch of the War Production Board. My office was at 17 Court Street, Boston, and my headquarters in Washington. My heart failed me in January, and I have been in the hospital since. Luckily, machine tools were no longer critical when my health gave out. I hope to leave the hospital soon." On May 24 we learned that Mansfield is out of the hospital and much better, but he will have to go slowly for a while.

Charles Tufts, X, Vice-president of the Allied Chemical and Dye Corporation, New York City, writes: "You'll be glad to know that Vermilye reports a good convalescence after an illness of several months." — Clarence Brown, IV, estimating engineer and purchasing agent of building construction with Wark and Company, general contractors, Philadelphia, has been located in Philadelphia since 1920. During the past three years, the company has been engaged in the construction of large defense plants and Army projects.

Phil Moore says that the news in the annual class letter stimulated Bill Newlin, who is secretary of the faculty of Amherst College, Amherst, Mass., to send him a very pleasant letter. — Bob Williams is still busy with the invention and design of submarine signal apparatus. He writes:

1901 Continued

"My son-in-law has just been made a major. I saw Harry Hodgdon of Wollaston, Mass., at Thompson's Spa recently. It was the first time I have seen him in several years. He was looking well and prosperous."

We regret to have to report that in response to the annual class letter, we received a statement which said that Robert Andrew died suddenly from a heart attack on June 10, 1942. A newspaper clipping was enclosed which gives additional information about him. He was born in Cincinnati, Ohio, and was graduated from the Woodward High School and Course II of the Institute. He resided in Hyde Park, and at the time of his death was president of the Electric Railway Equipment Company, Cincinnati, Ohio. He is survived by three brothers, two of whom were associated in the business with him, and three sisters.

After a brief retirement, Francis Cady, VI, formerly with the Colonnade Company, Cleveland, is now technical engineer in testing and development work with the Osborn Manufacturing Company, Cleveland, makers of industrial brushes and molds. — Ralph Robinson, V, is manufacturing engineer for the General Electric Company, Schenectady, N.Y., where he has been for many years. His work is manufacturing and development — all types of electronic tubes. Ralph says: "I'm competing for grandfather honors! I have three grandsons and two granddaughters."

Grace MacLeod, V, is professor of nutrition at Teachers College, Columbia University, New York City. She is also chairman of the Nutrition Committee of Greater New York and chairman of the nutrition advisory committee, New York chapter of the American Red Cross. Ed Fleming, III, is a metallurgist with the American Smelting and Refining Company, Salt Lake City, and is at present in charge of smelter research. He writes: "I spend most of my time traveling, but I have a wife and daughter at home in Los Angeles."

Sumner Hazlewood, I and II, retired in 1941 but is now doing part-time work for the L. S. Thorsen Corporation, Ellsworth, Maine, as designing engineer on mechanical equipment for boats for the Navy. — Harry Whiton IV, retired on November 1, 1942, after 36 years in the office of supervising architect, now a part of the public buildings administration of the Federal Works Agency. He lives in Brentwood, Md. — GUY C. PETERSON, *Secretary*, 788 Riverside Drive, New York 32, N.Y. THEODORE H. TAFT, *Assistant Secretary*, Room 3-266, M.I.T., Cambridge, Mass.

1903

A note from Charles E Locke '96, Alumni Secretary, gives a brief account of Pulsifer's connection with war business. He is a consultant for three shops in Cleveland: the American Metal Treating Company, the Ferry Cap and Set Screw Company, and the Cleveland Automatic Machine Company. Professor Locke also states that in 1914 Pulsifer "in his spare time produced a small book, *Inspection of Metals*, which has sold over 10,000 copies." During more than half of 1942, he was in Washington working for the conservation and substitution branch of the War Production Board. — Carmichael writes from Lawrence, Mass., that last August he was appointed chief officer of the map unit of the planning and technical division of the Lawrence Municipal Defense Council. In connection with local defense, he has been making maps and laying out gas decontamination centers.

We have received notice of the death of Charles W. Beverstock, I, on March 13 in Newberry, Calif. We hope to give a more extended account of Beverstock's career in a later issue.

In our notes next fall we shall give a full account of our fortieth reunion, held on June 25 to 27 at the Griswold Hotel in Groton, Conn. Meanwhile, we wish to remind you that we can't have class notes in The Review unless we hear from you. — FREDERIC A. EUSTIS, *Secretary*, 131 State Street, Boston, Mass. JAMES A. CUSHMAN, *Assistant Secretary*, 441 Stuart Street, Boston, Mass.

1907

Through the great courtesy of Ernest Hartford, Executive Assistant Secretary of the American Society of Mechanical Engineers, who in some way learned of my endeavors to secure information regarding our genial classmate of our freshman and sophomore years, Jimmie Walsh, I have some extremely interesting facts to pass on. Jimmie, officially Colonel James L. Walsh, who from 1922 until 1941 was active as an officer and director in banks and other corporations in Detroit and New York City, following a previous military career, has, according to Mr. Hartford, "entirely subordinated his business interests, giving practically all of his time to the war activity of the American Society of Mechanical Engineers, the Engineers' War Board, and Secretary of War Stimson's technical committee."

The following is an introduction made by Major General H. S. Aurand before the War Production Clinic at Chicago on March 11: "Back in 1917, at the start of World War I, about 15 young regular Army officers were caught in the ordnance school at Sandy Hook Proving Ground, N.J. Like all young officers, they were making every effort to get back to the combat branches to which they belonged. But in Washington as chief of personnel division of the Ordnance Department was one of the hardest-hearted men in history. This man had the job of recruiting personnel for a greatly expanded Ordnance Department and had no intention of letting 15 young regulars escape from his grasp. As a result, they spent the war and a great many years afterward in the Ordnance Department. This hard-hearted chief we knew in 1917 as Major James L. Walsh. I say 'we' because I was one of the 15 students.

"Whenever it is necessary to introduce a graduate of West Point, you can get most of the facts of his career from a document known as the Cullum Register. Each volume covers a ten-year period. At the present moment it is necessary to consult four volumes of this register in order to get the military history of Colonel James L. Walsh. This history begins with his entrance in the Military Academy on June 15, 1905; his commissioning as a second lieutenant of the Coast Artillery in 1909; his detail as first lieutenant in the Ordnance Department in 1910, as a captain in 1912, and as a major in 1917. The most noteworthy entry during this period in the light of his future career is: 'At Columbus, New Mexico, Ordnance Officer of Punitive Expedition to Mexico, April, 1916, to April, 1917.' During this period, Captain Walsh devised the first ordnance mobile shop, an agency of prime importance in our mechanized warfare of today. In January, 1918, Walsh was made a lieutenant colonel in the Ordnance Department and left his personnel desk. He toured England, France, Italy, and other Allied countries, and reported to Washington as personal assistant to the Chief of Ordnance and later as his executive assistant. In October, 1918, he was promoted to the grade of colonel. For these services which he rendered to his country, he was awarded the Distinguished Service Medal.

"This record should have satisfied any ordinary mortal, but Colonel Walsh had only begun on his career in aiding military preparedness in this country. Immediately after World War I, he initiated two enterprises: One was the founding of the periodical known as *Army Ordnance*, which through all the lean days between the wars carried the message of industrial preparedness to those who cared to read it. In enlisting support for this periodical, Colonel Walsh secured the co-operation of the civilian industrialists at a time when their thoughts were far away from making munitions. The other task which he undertook was the formulation and continuation of what is known today as the 'Ordnance District Office System.' By this system we were enabled to launch the present stupendous munitions program very much more rapidly than would have been possible had no such organization been at hand. In 1922, Colonel Walsh retired from the active list of the Army, but he did not retire from his interest in the production of munitions. For many years he was the civilian chief of the ordnance district office in New York City, and in that office created the pattern which was followed in the organization of district offices elsewhere.

"With a past history such as this, we are not surprised to find Colonel Walsh playing a prominent part in those phases of World War II for which he is so well prepared. Among his activities at the moment, he is vice-chairman of Secretary Stimson's Technical Committee for Civilian Defense, and he is chairman of the war production committee of the American Society of Mechanical Engineers. But this fails to give a full picture of the many and varied activities which Colonel Walsh has undertaken on behalf of the war effort. In all wars, four bottlenecks

1907 Continued

occur successively: first, plants and tools or facilities; second, materials; third, man power; and fourth, transportation. Grouped together, these problems are known to the military as logistics. Colonel Walsh conceived the idea of bringing together at small informal dinner meetings those people in Washington who were working on the solution of a portion of the logistical problem. To use his own words, he himself acted as a catalyst. But to those who attended these dinners he was a man who enabled us to talk face to face with the fellow who had an opposite view. To give you an idea of some of the people who talked across the table, there were Rear Admiral Emory S. Land ['07], chairman of the Maritime Commission; Joseph B. Eastman, director of the Office of Defense Transportation; Major General C. P. Gross, chief of Army Transportation Corps; W. C. Kendall, chief of car service division, American Association of Railroads; Major General W. D. Styer ['22], chief of staff, Services of Supply; Major General L. D. Clay, assistant chief of staff for matériel; Major General L. H. Campbell, chief of Ordnance, United States Army; Major General E. B. Gregory, Quartermaster General of the Army; Rear Admiral A. B. Anderson, assistant to the chief of naval operations; Brigadier General S. C. Godfrey ['07], chief engineer, Army Air Forces; and many others. The resulting co-ordinated action on the part of those who attended his dinners has had an immeasurable effect on the solution of many of the trying logistic problems with which the country is faced in the prosecution of the war. What Colonel Walsh heard at these meetings and what he already knew inspired him to undertake journeys across the land, preaching to the unbelieving the necessity for such solutions. From both the military and the civilian points of view, he has made himself an expert in the logistics of total war."

In order to prove to us all that Jimmie keeps busy, Mr. Hartford sent me a list of the itineraries of many of his recent trips, covering the period from last December to May 1. During 50 to 60 days of that five months he was on the move, covering territory from Jacksonville, Fla., to Montreal and Toronto, and from the Atlantic Coast to Tulsa, Okla., speaking almost daily before groups of businessmen, engineers, and students. Our hats are off to you, Jimmie Walsh, for your nationally useful part in the war effort.

Among other '07 men of vital prominence in the war is Major General Lloyd R. Fredendall, who has been mentioned in recent issues of The Review, and who during the early spring was commanding general of the United States forces in Tunisia. On May 31, General Fredendall became commanding general of the Second Army, with headquarters at Memphis, Tenn., succeeding Lieutenant General Ben Lear. We can add a few facts not previously mentioned in these notes: Lloyd was married in 1908. He has a daughter, and a son who was graduated from West Point and is now a major in the Army.

Our Class President, Alexander Macomber is also performing a vitally important piece of civilian service. He is the director of the manufactured-gas division of the War Production Board, which has charge of all the city gas companies in the United States. Mac wrote me under date of May 15: "There are many problems, particularly in the war areas with swollen populations, where restrictive measures have had to be installed, while the matter of additional capacity, equipment, and supplies is serious. This keeps me busy running around the country, as well as directing the administrative work at headquarters. While staying at the Dodge Hotel in Washington, I had an opportunity to renew acquaintance with J. P. Alvey, who is budget officer of the Department of the Interior and makes his permanent home at that hotel. Likewise, J. E. Moore, who is chief of the electric-production section of the War Production Board is living at the hotel. . . ."

In the Worcester, Mass., *Telegram* for April 28, I noticed an item about a speech made by Charlie Allen at a meeting of the Spencer Civic Club. He told of his experiences at the A.O.C. School at Fort Leavenworth, Kansas, from which he had recently returned. — Hud Hastings thoughtfully sent me a postal card in early May advising me of his participation in a radio panel discussion on the topic: "Should Collective Bargaining be Extended to Include Foremen?" over the Blue Network on Sunday afternoon, May 9. — Wheaton Griffin of Utica, N.Y., wrote me of his son, Frederick, who has been assisting his father in the wholesale grocery firm of Griffin and Hoxie, and who was graduated from Hamilton College in 1937. Frederick left for military service on April 27.

On April 3 occurred the death of Jeremiah J. O'Sullivan, who was affiliated with our Class in Course I. He was a prominent local political figure and lawyer in Lowell, Mass. — Harry R. Crohurst died on March 12. He was a graduate in our Class in Sanitary Engineering and had always followed his profession, having been sanitary engineer in the Massachusetts State Department of Health from 1907 to 1914, and then in the engineering corps of the United States Public Health Service for the rest of his life. At the time of his death, he was senior sanitary engineer, located in Cincinnati, Ohio. He had been a member of the faculty of the School of Public Health of the University of Minnesota, a consultant to the National Resources Board at Washington, and a consultant on stream pollution and industrial-waste studies to the Tennessee Valley Authority. He left his widow, a daughter (Cornell '42), and a son (Cornell '44). — The death of Howard S. Palmer occurred at his home in Stoneham, Mass., on May 4. Howard was with us during our first year, in Course VIII, Option 3. From 1908 until the time of his death, he was with the New England Telephone and Telegraph Company in Boston, holding various positions in traffic and engineering. He left a widow, a daughter, and three sons, who vary in age from 29 to 17. — I wrote letters of sympathy on behalf of the Class to the families of these men.

I hope you have all read the third annual report of the M.I.T. Alumni Fund, and have noted the very creditable record made by '07 for the year 1942–1943, with 88 per cent of our quota as to number of contributors, and with 108 per cent as to the amount of contributions. Henry B. Kane, '24, Director of the Fund, in his report calls attention to the fact that '07 had the greatest percentage of contributions of any Class since 1890 and that our total of $3,166 was the second highest amount given by any Class, exceeded only by 1913 with $3,380. Good work, fellows! And yet does it occur to you that while we may be pleased, we should not be satisfied with this result for 1907? For example, if we had had 15 more contributors, and thus had reached our quota in that respect, and if these 15 men had averaged $15 in their giving, the average amount suggested by the Alumni Fund Board, this would have increased our total of gifts by $225 and our Class would have been first, instead of second, in the total amount. Furthermore, with all honor to the Class of 1913 who coined the phrase, "A quota is not a goal to shoot at, but rather one to reach," and then got busy and reached theirs, had it occurred to you that in these days of quotas and goals in factories for production of war materials, red-blooded men, whether executives, foremen, or workmen, are not satisfied with merely *reaching* quotas, but they strive to *exceed* them. I suggest to '07 men as a slogan for our Class in connection with the Alumni Fund for 1943–1944: "A quota is not a goal to shoot at, but rather one to exceed," and then let us emulate 1913 by translating these words into action. Let every man who gave last year contribute again, and then if 25 fellows who did not have an active share in this project will participate this year, our quota as to number of contributors will be smashed. As to the amount, if we have at least sums equal to those given last year from all former contributors, plus new gifts from new givers, the quota will be passed. Lawrence Allen, our Class Agent who has done such a fine job, does not know that I am writing this, but I am sure he will agree to the idea. It's entirely reasonable. Let's do it — and do it *now*, while we think of it. Let's not have to be followed up. — BRYANT NICHOLS, *Secretary*, 23 Leland Road, Whitinsville, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

The fourth and last bimonthly dinner and meeting of the Class for the 1942–1943 season was held at the University Club in Boston on Monday, May 24. The following were present: George Belcher, Sam Hatch, Bill Booth, Karl Kennison, George Freethy, Jeff Beede, Joe Wattles, and Nick Carter. Several of the regulars were called away unexpectedly.

Linc Mayo reports that some 30 of the Class replied to his letter asking for dues.

1908 Continued

He would like to hear from more. — There will be a detailed report of our 35th reunion in The Review next fall.

While I was in Chicago in May, I had a chance to see Bill Toppan, who is with the Army Ordnance Department in Chicago. I also saw Sydney James and Dick Kennard. I certainly enjoyed the opportunity of talking over old times and of learning what the various fellows are doing. — W. E. Poor, who was formerly executive vice-president of Sylvania Electric Products, has been elected president of that organization.

The following letter was received from Steese: "Not seeing the old gang periodically is a hardship, and I see little chance for a return visit this commencement. Give my best regards to everyone. My job with the Combined Chiefs of Staff in Washington gives me a grandstand seat to see the war show as well as the political battle. Since nearly all of the information concerning future prospects and present actualities is secret in nature, I'm almost afraid to talk freely in a social manner. I hope I do not become a crab or a clam." — H. LESTON CARTER, *Secretary*, 60 Batterymarch, Boston, Mass.

1909

Your Secretaries are more than pleased to report that just prior to his death another honor was conferred on Father Main. Each year the Engineering Societies of New England make an award of "a scroll of illuminated parchment, suitably inscribed, to a living engineer who shall merit recognition by his fellow engineers of the New England States." Father Main had been selected as the recipient for 1943. His passing, however, prevented the granting of a *living* award, but nevertheless his memory was honored at the annual meeting of the societies on April 28 by a deserving tribute read by the chairman of the committee which made the award.

A most welcome letter has been received from Egerton Bettington, VI, who has been in England for a number of years. The letter depicts the all-out effort being made by the women of that courageous country. Accompanying the letter was a circular describing special "taper-bore" rivets manufactured by Aviation Developments, Ltd., with which company Edgerton is connected. He wrote as follows: "I was very pleased to receive your letter of March 6, but I was equally sorry to hear of the death of Charlie Main. He was certainly a very stanch supporter and will, I feel sure, be sadly missed.

"You will see from the above heading that I am in the aircraft industry, working on a specialized form of riveting, details of which are fully set forth in the enclosed reprints.

"Your question concerning the situation and conditions in England relative to the war effort is one requiring an abler pen than mine to set forth. In any case the censor, if not modesty, precludes me from saying what I should like to tell you. I feel no compunction, however, in paying a whole-hearted tribute to the women of this country. In fact, by not doing so I should be greatly lacking in courtesy and justice.

"While our womenfolk are not allowed to bear arms and fight shoulder to shoulder with men in the front line, they have stopped short of nothing else. They are manning antiaircraft guns, searchlights, barrage balloons, and, perhaps the most hazardous of all, they are fire fighting during blitzes. Perhaps their most valuable contribution is in industry. It would be safe to say that in the Aircraft industry in some instances up to 60 per cent of the hands are women.

"The response to the national call has to be seen to be believed. There are few, if any women, old or young, married or single, infirm or blind, who are not participating in some form or another. In this and other connections I do not think I can do better than draw your attention to the *Aero Digest* of December, 1942, wherein members of a United States mission contribute articles on their impressions of the British aircraft industry.

"After graduation I went to South Africa for three years and then returned to this country, where I have remained except for the period of the last War and the two following years, when I was in the Royal Air Force.

"Kind regards to you and all our old friends. I fervently hope that our united efforts will not be much longer in bringing this senseless and barbaric struggle to a successful end."

Ever since he left M.I.T., Walter Rodman, VI, has been teaching electrical engineering at the University of Virginia at Charlottesville, the home of Thomas Jefferson. Walter, who is now professor of electrical engineering and dean of engineering, writes as follows: "I am still carrying on in my 33d year at the university, and expect to stay here for the rest of my active days. In common with all educational institutions of our type, to say nothing of others, we are now struggling with the new setup for partial operation under the Navy V-12 program, which we expect to undertake about July 1.

"I am sorry not to have gone to several meetings at which I used to meet you, but my travels have been practically abandoned since Pearl Harbor. Two short trips, one to New York last June for the Society for the Promotion of Engineering Education, and one to Knoxville for the regional S.P.E.E., have constituted my travels from base for some period. My chief hope is that before too long a period this war will be over, and we in engineering education may have some hope of a return to a more reasonable system of conducting our affairs in a more stable world."

Andrew L. Matte, VI, 36 Druid Hill Road, Summit, N.J., writes as follows: "After leaving the Institute, I worked for several concerns in various unrelated lines of engineering. I then took a year's graduate work at Technology, and became associated with a street railway in Detroit, where I did some pleasant but rather unproductive — and decidedly unremunerative — work in charge of a small testing laboratory. I then obtained a position with the American Telephone and Telegraph Company in their department of development and research, where I have been ever since, except for a formal transfer, without substantial change in duties, to the Bell Telephone Laboratories in 1934. I have just completed 25 years of service with the company. My activities have been principally along the lines of carrier telegraphy and kindred subjects. I was married in 1922 to Anna Ryder Greene. We have no children. We live in a little white house on top of a hill about 500 feet above Newark Bay and, except for the intrusion of a volcanic ridge, within sight of salt water. Since I last sat on Rogers steps, life has been very pleasant, quiet, and uneventful."

Here is some more news from Washington, sent in by Molly, who is right on the job for '09 as well as for Uncle Sam: "Ed Hahn, II, is now a civilian member of the staff of the purchases division, headquarters of the Army Service Forces, and is located in the Pentagon Building. His duties relate to contacts between the purchases division and the smaller War Plants Corporation. Burr Robinson, III, is here with the zinc division of the minerals bureau of the War Production Board. He is located in Temporary Building. R. Franz Schneider, VII, is with the War Shipping Administration in the Department of Commerce Building, but what he is doing I don't know, as I have been unable to reach him on the telephone.

"On May 4, the Washington Society of the M.I.T. had a ladies' night and dinner at which Mrs. Franklin D. Roosevelt spoke on her experiences during her visit to Great Britain. The meeting was a great success. I saw Ed Merrill, I, there. He is president of the Capital Transit Company.

"Have been reorganized again myself and have left the priorities branch, where I was located so long. I am now in the office of the assistant director for production service, production division, headquarters of the Army Service Forces, and have moved to the Pentagon Building in the process. My work relates more to Army requirements of materials and products than to priorities. Am really going to try to arrange another class luncheon one of these days, but unless the recent pressure of work relaxes a bit, don't know how I am going to do it."

Clarence Maynard, I, who lives in Belmont, Mass., cites his activities as follows: "I am acting as business agent for the Massachusetts Department of Mental Health. The work involves purchasing of supplies, engineering, and construction for the 16 institutions comprising the department, whose annual budget is over twelve million dollars. The supplies range from safety pins to boilers, and I find the work most interesting."

The Review Secretary learned recently that Florence Luscomb, IV, is living in Cambridge, so he took the liberty of calling her on the phone to learn of her activities. Ever since graduation she has devoted her inexhaustible energies to one public cause after another. For example, at the present time she is vice-chairman of

1909 Continued

the Civil Liberties Union of Massachusetts, a member of the board and past president of the United Office and Professional Workers union of the Congress of Industrial Organizations, and chairman of the Boston chapter of the Joint Anti-Fascist Refugee Committee. This committee is expecting 700 to 1,000 refugees from North Africa who are to be resettled in Mexico where they are being offered an asylum. These refugees consist of men, women, and children who fled from Franco Spain, and men of several countries and of many nationalities who have been fighting Hitler and Mussolini. Most of them have been without medical aid in concentration camps in the Sahara for periods as long as three years. The committee is now trying to raise money for their care. Miss Luscomb is also a member of the Volunteer Land Corps and to demonstrate that she is a really active member she is spending the summer in Wayland, Mass., working 10 to 12 hours a day on a farm. With the exception of the plowing and harrowing, she will do all the work herself. She plans to raise enough vegetables to provide for a family of seven for one year. Last summer she performed this same activity on a farm in Vermont. Miss Luscomb is anxious to obtain in the fall a job as a machinist and has already passed the necessary civil service examinations. She would appreciate any assistance along this line.

George Wallis, the Assistant Class Secretary who looks after the Chicago area and who is president of the Creamery Package Manufacturing Company, recently made a trip to New York. But let George tell the rest: "Before leaving for New York on May 10, I wrote to Paul Wiswall for a luncheon appointment the following day, asking him to include some other members of the Class in the immediate vicinity of the hotel. I was treated to a real surprise when Paul, with his characteristic genius for organizing a party, invited me to the Technology Club to have lunch with Jim Critchett, Reg Jones, Harold Ballard, Dale Ellis, Larry Forrest, Hardy Cook, and Chet Pope. Aside from having a delightful visit with so many old friends, I found the secret of having a healthy and vigorous life after 34 years away from Boylston Street — a keen interest in a hobby. The hobbies of our classmates vary all the way from farms to photography." — PAUL M. WISWALL, *Secretary*, 90 Hillside Avenue, Glen Ridge, N.J. CHESTER L. DAWES, *Review Secretary*, Pierce Hall, Harvard University, Cambridge, Mass. *Assistant Secretaries:* MAURICE R. SCHARFF, 235 Second Street, Southeast, Washington, D.C.; GEORGE E. WALLIS, 1606 Hinman Avenue, Evanston, Ill.

1910

In order that the members of the Class will not feel that their Secretary is entirely negligent, he has endeavored to find a few items relating to classmates. — Clarence Francis, President of General Foods Corporation, recently announced the creation of a new corporate post, in the assignment of Lewis W. Waters, formerly vice-president in charge of research and development, to serve as vice-president in charge of scientific relations. "In taking this step," Mr. Francis said, "I believe our company is pioneering in a new field of industry — scientific relations, so far as the food industry is concerned. It is practical recognition of the increasing importance of a scientific approach to the basic problems of nutrition, as differentiated from commercial research activities."

Waters has an extensive scientific background in the food industry. A former chemistry instructor at M.I.T., he was a Du Pont research chemist, a chemist with the Campbell Soup Company, and director of United Fruit's tropical laboratory. In 1920, he joined the General Foods group, when he became research manager of the Minute Tapioca Company. He has been a lecturer at New York University, is a consultant of the War Production Board's scientific committee, and is a member of various scientific societies.

Dan Gibbs is living in Auburn, Maine, and is spending his time traveling to his various locations of endeavor in Bath, Portland, and Lewiston. Your Secretary had a most pleasant luncheon with him. — In a recent issue of *Fortune* was an illustration showing a class of Army administrative students, among whom was Colonel Harry A. Hale.

Present at the annual Alumni Banquet, held on January 30, were Bobbie Burnett, C. W. Wallour, Jack Babcock, Charlie Greene, and Herb Cleverdon. — Charlie Greene ran into Dutch Rietschlin in Boston recently. Dutch is well and is now having a breathing spell from urgent war activity. — HERBERT S. CLEVERDON, *Secretary*, Corps of Engineers, Area Engineer Office, 76 Pearl Street, Portland, Maine.

1911

Truly my cup runneth over! As of May 31, the first comparative class standings in Alumni Fund IV show that among the 44 classes graduated since the Nineties, '11 is leading the entire field, with 58 per cent of its quota of contributors and 67 per cent of its dollar quota. Almost in the same mail came word that an '11 man had just made this year's first four-figure pledge to the Fund. In an accompanying letter was evidence that the reference in my Class Agent's letter to the fact that '12 beat '11 in the average contribution last year just as Arch Eicher '12 beat us with a last-second field goal in Field Day 1908 bore fruit, for our generous contributor said: "We must never let 1912 beat us again."

Let's have a little fun, mates — a "what's-my-name-soliloquy," as 'twere. I'll impersonate, verbally, our g.c. just referred to: "I registered at Technology from Springfield, Mass., and I got in with that Newbury Street gang. I was manager and played right end on the football team that lost that heartbreaker to 1912. That fall my brother registered and studied Architecture; I was in the Course in Sanitary Engineering. What's my name?" Need another set of clues? Here goes: "I played ingénue roles in several of the Tech Shows. I was on the 1911 'Technique' electoral committee, the junior prom committee, and made Masque and Osiris. Some years ago I landed in New York City with a big advertising firm with offices in the Graybar Building. Now I'm general manager of the firm. What's my name?" If you haven't guessed by now, write to Dennie and enclose subscription addition to the current Fund, or persuade a nonsubscriber to subscribe.

In late April, the *Wall Street Journal* featured a front-page story on Baltimore's "D-day" plans, as evolved by the city commission headed by our Ban Hill, I, President of the Baltimore Transit Company (see '11 notes in June issue). "How the program is being pushed ahead," says the article, "becomes no mystery when you meet Mr. Hill. He is a slight, wiry, energetic type. Low-spoken. A native Baltimorean. Although definitely businesslike, his personality leans strongly to the human side, as reflected in the regular visits he makes to the hospitals to chat with 'his men' who have been hurt and are hospitalized under a special company plan. . . . He joined the Baltimore Transit Company in 1926 and rose to the presidency in 1936."

Fat Merrill, I, who thoughtfully sent me the clipping, wrote the following reminiscing letter: "I remember Ban when he was 'slight and wiry and energetic.' And now, doggone, here is the paper claiming that he hasn't changed a mite. He probably has a full head of hair, too — not that that could make Ted Parker or me envious. . . .

"But on Monday mornings during the fall and spring Ban was a sight. He had a motorcycle ('motorsickle' he used to call it) and on it he used to escape to New Hampshire or Vermont from the pace of Engineering A. He was the kind of man that we need right now, need right here in this house of mine where we cannot get a chicken for love or money. What he did on those trips was to decimate the poultry flocks of the two states. He probably sought out the place where the greatest number of road-feeding hens was to be found, for when he returned his 'motorsickle' was so covered with chicken feathers that it looked as though he had been through a Hollywood snowstorm. When he dismounted, it looked for all the world as though a part of the machine had detached itself and walked off on two legs.

"The clipping shows that Ban is still tangling with things. The fact that this newest venture of his has covered him with Henry Morgenthau's feathers is a rather good sign that he is heading a formidable project. . . . I have been glad to see news of him in the class notes frequently. I am delighted to read of his current efforts, and I'm proud that I knew him when!"

From a late April issue of the New York *World-Telegram*, Sellie Seligman, III, sent me Peter Edson's "Useful By-Products" syndicated feature. Here's the opening entry: "A naval commander named Luis deFlorez, who is attached to the division

1911 Continued

of special devices in the Bureau of Aeronautics, has just come back from Guadalcanal and such places with a suggestion for a new special device that should add much to morale in remote outposts. Commander deFlorez made his discovery quite by accident. Wanting to take the boys a gift they would appreciate most, he bought a bottle of Scotch and carried it with him, carefully wrapped in an old newspaper.

"When he got to the base he produced his prize package, but much to his surprise and chagrin nobody paid any attention to the Scotch — they all went for the newspaper and read it to shreds. From this observation steps the suggestion for the deFlorez morale builder: Instead of wrapping machinery, equipment, ammunition and such supplies in new kraft paper, deFlorez proposes use of old newspapers and funnies."

Interesting news came in the following letter from Zeke Williams, XI: "My son, David, was graduated from Harvard last June, and his old man was a bit proud of him. Aside from participating in many college activities, he was graduated *magna cum laude* and was a member of Phi Beta Kappa. He must have inherited it all from his mother. At present he is in the service in the Canal Zone.

"I had luncheon with John Wilds, II, in Chicago recently. He looks fine. He is president of the Protection Mutual Fire Insurance Company, and his associated companies are carrying over fifteen and one-half billion dollars of insurance on plants all over the country, so you can see that his hands are full.

"Between keeping this business on an even keel [Zeke is general manager of Erwin, Wasey and Company, advertising, Graybar Building, New York City] and the various jobs I have done and am doing for the government, I seem to be busy all the time."

Marc (Aurora Borealis) Grossmann, III, director of research of the Carnegie-Illinois Steel Corporation, Chicago, Ill., writes: "It's been a continued source of amazement to me for years how you manage to keep tab on everybody. I can't refrain from saying thanks and tsk-tsk about your unduly gracious note about me in the May class notes. Recently someone said to me: 'You know, I met the most amazing fellow recently. He can go to a musical show and come home and get pretty near to playing some of those tunes just by ear.' I answered contemptuously: 'You should have known Orville B. Denison at M.I.T.' " — From Frank Osborn, III, Andes Copper Mining Company official in Potrerillos, Chile, S.A., came the following: "Your Armistice Day letter actually reached me on January 23, and here is an immediate response. I'm so busy I don't know where the time goes. My trip to the States in November, during which I ran into Carl Richmond in Washington, was supposed to be 'off the record' for diplomatic reasons. Hope to see you next trip. Best wishes." — Did you see the candid camera snap in the Boston *Herald* in early May of Prexy Carl Ell, XI, greeting Northeastern University's first coed? It was a good shot of both the admiring president and the first woman student, Helen Yates of Watertown.

Let me give a personal note of thanks to my classmates and fellow Alumni who supported me in the recent competitive election for member of the National Nominating Committee from District 2. Be assured I shall do my best to adequately represent the district, but please don't write for free seeds.

So endeth another volume of '11 notes, and as always it has been one of the joys of my life to compile and present them. — Always remember that the more I hear from you, the more you'll hear from me, so make it a summer *must* to "Write to Dennie." — ORVILLE B. DENISON, *Secretary*, 82 Elm Street, Worcester 2, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1912

Word comes from Dave McGrath that he is recovering slowly from a serious illness. I know he would be glad to hear from any of you who could find time to drop him a line at 411 Maitland Avenue, West Englewood, N.J.

We are pleased to report that H. Malcolm Priest was the recipient of a $2,700 award of the James F. Lincoln Arc Welding Foundation. — Among the sons of classmates now at the Institute is William P. Reynolds, son of Charles V. Reynolds. William, who is a freshman, expects to be called to duty in the Navy V-5 program.

J. C. Hunsaker is often referred to in the press, relative to our aircraft program. His introduction to *Fighter Facts and Fallacies* by John G. Lee '21 has received very favorable comment.

T. O. Hotard, President of the Orleans Parish School Board, has recently been appointed Honorary Secretary of M.I.T. in New Orleans for another five-year term.

Your Secretary spent a very pleasant evening recently in Cleveland with Carl Rowley, who is extremely busy on the construction and alteration of war plants. He would be pleased indeed to see any of you when you are in his vicinity.

Your Secretary urges you to make a mental note to send him news about yourself and your friends. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. MCGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N.Y.

1914

The April 15 issue of the Boston *Herald* showed Clarke Atwood surrounded by four stylists representing the Fashion Group of Boston. Clarke was presenting some of the new fabrics developed by the Atlantic Research Associates, of which organization he is the head. This corporation, formerly controlled by the National Dairy Products Corporation, is being acquired by Clarke and his associates.

C. W. Ricker, head of the department of electrical engineering at Tulane University, has been elected a vice-president of the American Institute of Electrical Engineers. — Engineering honors also go to another classmate. William Grant has been made an honorary life member of the American Society of Civil Engineers. Grant is a consulting engineer in Fort Worth, Texas.

One by one, '14 men — in spite of their age — are entering the armed services. Ros Barratt is now a lieutenant commander and is at present located at the Naval Air Station at Norfolk, Va.

Matched only by Brigadier General Alden Waitt, Dean Fales probably can claim the class record for speaking engagements. Dean has been addressing a very large number of groups on the general subject of what kind of an automobile the public can expect to be able to buy in the first two years after manufacturing again starts. He says the new cars will be just about like present models, with radical changes following a few years later. Future engineering trends will be influenced by 100 per cent octane gasoline. — H. B. RICHMOND, *Secretary*, General Radio Company, 30 State Street, Cambridge, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York, N.Y.

1915

As of May 31, our score in the Alumni Fund is $1,639 from 69 contributors. This is 39 per cent of our contributor quota and 55 per cent of our money quota. My hardest job each year is holding the men who have given the previous year. You fellows reading this are the ones who gave last year. There are still some left who haven't given this year, and Technology needs our help more than ever now. Show your loyalty by sending in at least as much as last year, and more if you can, so that we can hit our 100 per cent quota mark.

Ernest M. Loveland has moved back to 309 Summit Avenue, Hackensack, N.J., from North Brookfield, Mass., and Colonel Gerald B. Robison has moved to 280 Glenwood Road, Ambridge, Pa., from Fort Monroe, Va. Let's hear from these two fellows, so we'll know what these address changes mean. — To relieve our uncertainty about his change of address, Alfred Clarke, who moved to Indianapolis from Omaha, writes that the Indianapolis Bleaching Company is a branch of Bemis Brothers Bag Company, with whom he has been associated for many years.

Is there anybody who can tell us about Gerard R. Walsh? He moved to the State Hospital, Deer Lodge, Mont., from Hamilton, Mont., and some of the boys have been inquiring what his position is at the hospital. — Are there any stamp collectors in our class? Perhaps some of the sons of the class members will want to know that the editor of *Scotts Monthly Journal* is Deoch Fulton. His address is 1 West 47th Street, New York City. Your Secretary's secretary is now deep in "Railway Stamps of the World."

After sending a sizable check for the Alumni Fund, good old Bill Campbell writes from Berlin, N.H., "I've had a couple of visits with Doug McMurtie, but I've been on the run so much that I

1915 Continued

haven't really had a chance to sit down over a couple of beers with him and get up to date on the crowd. . . . This is a great country up here even if a bit strenuous on weather most of the year. Give my best to any classmates you meet."

And so ends our column of notes for this season, with my best wishes for you all to enjoy as happy and as cheerful a summer as possible under these war conditions, and my thanks for all that you've done to "help Azel." — AZEL W. MACK, *Secretary*, 40 St. Paul Street, Brookline, Mass.

1916

Joe Barker received an honorary degree of doctor of engineering at the 59th graduation exercises of the Case School of Applied Science. Joe is a special assistant to the Secretary of the Navy in Washington, D.C.

Alex Brest, who is more or less running our Army engineer officers' school at Richmond, Va., has just been promoted to the rank of lieutenant colonel in the Corps of Engineers.

Dave Patten, now a commander in the Navy, is working in the Office of the Chief of Naval Operations. He runs into Henry Shepard and Joe Barker frequently. Dave is living at the University Club in Washington. Classmates visiting Washington may be sure of his usual hospitality.

Bill Kniesner practically commutes between New York City and Worcester. Your Secretary ran into him on the train recently. He's the same old Bill — even has a drag with the conductor. — JAMES A. BURBANK, *Secretary*, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, *Associate Secretary*, Coleman Brothers Corporation, 245 State Street, Boston, Mass.

1917

We learn from our New York correspondent that Leon McGrady has recently been in that city and that he had lunch with Dad Wenzell. The latter was consulted in the purchase of a spring coat for Lois Lee McGrady, aged nine. From the same source we learned that Dick Whitney, a lieutenant commander in naval aviation, has moved to Quonset Point, R.I. The balance of these notes is concerned with the recent election of Lin Noyes as president of the American Newspaper Publishers Association, a fact reported briefly in previous notes.

The April 24 issue of *Editor and Publisher — The Fourth Estate* carried a full-page spread, which said in part: "Linwood I. Noyes, quiet 48-year-old publisher of the Ironwood (Mich.) *Daily Globe* and newly elected president of the ANPA typifies the best all-around qualities found in small dailies which dot the Main Streets of America from coast to coast. His election marks the first time in the long history of the ANPA that a small daily publisher in the strictly non-metropolitan class, has been chosen to head that august body of publishers. To Lin Noyes, the power of the press carries with it the responsibility of informing the people, and never consciously misleading them. He has the same virile interest in preserving the freedom of the press as do his big brothers in the metropolitan field of journalism. But his aim is to inform rather than to make dogmatic recommendations. . . .

"There is nothing corny about Publisher Noyes. He is a small town newspaperman who thinks in big terms, whether the issue at hand has to do with his Ironwood daily or the American press as a whole. He comes from sturdy publishing stock. His grandfather, the late Luther Noyes was an itinerant journalist and judge who founded the *Marinette Eagle* in 1871 and the *Eagle Star* in 1878. His father, the late Frank E. Noyes gave up the study of law in 1844 to head the Marinette paper until his death in 1942. . . .

"Lin Noyes, iron gray and vigorous in manner, is a friendly man, whose judgment is respected wherever newspaper executives gather. He likes to write, has a keen sense of news values, but devotes the greater part of his time to the executive end of the business. His engineering background gives him a practical point of view in solving problems relating to his business. His sympathetic understanding of his fellow publishers' problems make him ideally qualified to head the ANPA under wartime conditions." — The Class through its Secretaries most heartily subscribes to these sentiments. — RAYMOND STEVENS, *Secretary*, 30 Memorial Drive, Cambridge, Mass. PHILIP E. HULBURD, *Assistant Secretary*, Phillips Exeter Academy, Exeter, N.H.

1919

The third annual report of the M.I.T. Alumni Fund was recently released. The Class achieved 73 per cent of its quota of contributors, which is quite an improvement over our previous performance. There were 122 contributors out of a quota of 166. Out of a quota of $2,985, we contributed $1,629, or 55 per cent. Those in the Class who have not yet contributed to the 1943–1944 Fund are urgently requested to do so.

The 25-year reunion mailings are still coming in. To date, 35 have sent in questionnaires and photos, and 18 have sent bonds. While this is a very good start, we hope that many more will reply very soon.

On April 28, Frederick J. Given, who is in charge of apparatus development work with the Bell Telephone Laboratories, 463 West Street, New York, wrote: "It took a bond drive at the Bell Laboratories to get me to act on your letter of last September. Finally, here are the questionnaire, picture, and bond. I haven't heard from the other members of the New Jersey committee regarding a roundup of '19 men. As you probably know, I don't have much extra time, but I'm still willing to do a bit." — Fred resides at 320 Harding Drive, South Orange, N.J., is married, and has two children: Donald Frederick, aged 20; and Virginia Evelyn, aged 18. His son is at Williams College, class of '44, and his daughter is at Skidmore College, class of '46.

James G. Strobridge, 2100 Connecticut Avenue, Washington, D.C., writes: "I am now a lieutenant colonel in the Corps of Engineers, and am still production chief of the Army Map Service. We are responsible for production of all maps for the Army Ground Forces and many for the Air Forces. We are running our plant 24 hours a day and are sure turning out the work." James suggests the 25-year reunion be a stag party in Washington.

Phil R. Thompson, 75 Egerton Road, Arlington, Mass., suggested that the reunion be in Boston or near by, and that it be stag and inexpensive. Phil says that M.I.T. is well represented at the Raytheon Manufacturing Company. — Ray Bartlett, who is vice-president of MacDonald Brothers, Inc., 444 Madison Avenue, New York, had lunch with your Secretary, early in May. Ray has been located in Pittsburgh and recently moved to New York, where he has expanded his New York office. He resides at 465 West 23d Street, and has been traveling quite extensively to increase production in several war plants. Ray has a son in the Air Forces in Florida, and a daughter at Albright College.

Walter F. Walworth, 34 Fairview Avenue, Arlington, Mass., writes that he has no preference as to reunion place or whether it be stag or mixed. He pledged a bond. — Dean K. Webster, Jr., suggests the Griswold Hotel, Eastern Point, Groton, Conn., or the Oyster Harbors Club on Cape Cod as places for the reunion. Dean says that his wife would come but does not know if many other women would be interested. — Cutter P. Davis writes: "I was quite surprised to note that I had made an overpayment toward one of the bonds. Inasmuch as you promise in writing that you will repay this either in the form of a lunch or a drink the next time I see you, you can surely count on my dropping in to see you the next time I am in New York." — Frank P. Reynolds, East Walpole, Mass., suggests that a mixed reunion be held near Boston.

Henry B. Blumberg, Calton Court, New Rochelle, N.Y., wrote on May 10 as follows: "I have read with interest the many letters received from our classmates, and will add a bit about myself and family. My business is in New York City, and I live in New Rochelle. I am married and have two daughters, aged 20 and 16. My older girl is a junior in college, and the younger attends the New Rochelle High School. The bond idea is excellent, and you can count on me."

The Boston *Herald* carried a story on January 24 about the election of Isidor Slotnik as president of the Associated General Contractors of Massachusetts. The story read in part: "Slotnik was graduated from M.I.T. in 1919, specializing in civil engineering and naval architecture. He entered the construction industry in 1919, with the Slotnik Company, founded by his father in 1896."

The May issue of The Review carried a note about the death of Frederic A. Baker on March 26.

1919 Continued

The Class is planning to have a dinner meeting in New York on September 15 to discuss 25-year reunion plans and to organize the committee work for the follow-up on increasing class participation in the reunion. Notices will be mailed several weeks before as reminders. Remember the date. Let's have a record attendance. — EUGENE R. SMOLEY, *Secretary*, The Lummus Company, 420 Lexington Avenue, New York, N.Y. GEORGE W. MCCREERY, *Assistant Secretary*, 131 Clarendon Street, Boston, Mass.

1920

Captain Edward Ellsberg, our Navy deep-sea salvage expert, has recently been resting at his home in Westfield, N.J., after a heavy ordeal of salvage work in the north and east African areas. Much of his work has been confidential, but the Navy has released a few details, such as the bringing up of a sunken Italian dry dock in one of the Red Sea ports. His work in the western Mediterranean consisted, among other things, of clearing harbors which the French forces blocked by sinking their own ships before surrender. Often under fire, he and his crew salvaged a number of ships the Axis thought they had sunk.

Colonel Donald B. Sanger has been assigned to the requirements section at the headquarters of the Army Ground Forces, Washington, D.C. His military honors include the Purple Heart, the Order of the Black Star, and the *Croix de guerre*.

Joe Goldthwait has been active as a specialist for the Controlled Materials Plan in New England. He has had many years of experience in the textile industry in New England and in the South, and for 15 years he was manager of one of the plants of the United States Finishing Company. — Foster Doane is with the Magnaflux Corporation, 5908 Northwest Highway, Chicago. Johnnie Rockefeller is the owner of All-Weather Springs, 140 Cedar Street, New York.

It was a pleasure to hear from Flossie Fogler Buckland, who is living at 1711 Randolph Road, Schenectady, and is working in the general engineering laboratory of the General Electric Company. She says the family all like the idea of her transformation from kitchen mechanic to wave mechanic. They attribute part of her success in keeping her hand in in mathematics by being the one who always had to keep the bridge score. — Lauren Hitchcock was elected to represent his district on the Alumni Association's National Nominating Committee.

Your poor neglected Secretary would certainly appreciate a scrap of news from you sometime between now and next fall. Hope you all have a good summer. — HAROLD BUGBEE, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

1921

Your subscription to The Review ends with this last issue of the present volume unless you have sent your Alumni Fund contribution to the current 1943–1944 Fund. If you haven't, buy another share of Technology and insure your next year's subscription with a check today. The first five dollars covers The Review and Alumni Association and Fund expenses; all you include over that goes to Institute projects. Fifteen dollars per capita is still the goal.

Several new books listed in recent reviews are the work of authors from the Class. Edgar Erskine Hume, C.P.H., a colonel in the Medical Corps, has written *Victories of Army Medicine*. The book covers war and peacetime achievements of the 168-year-old Army Medical Corps. Its author has an outstanding record of service and is the recipient of a Distinguished Service Medal for his successful campaign against typhus. — John G. Lee, II and IX, assistant director of research, United Aircraft Corporation, has written *Fighter Facts and Fallacies*. Illustrations and diagrams supplement a nontechnical discussion of various types of fighter planes. Kuo C. Li, II, has compiled a volume entitled *American Diplomacy in the Far East*.

Alan Osbourne, XIII, marine engineer of the Maritime Commission, has completed a second volume of the *Modern Marine Engineer's Manual*. The latest edition of "The Technology Bookshelf," distributed last Alumni Day, lists the following books as having been published since the previous edition: *Ornithologists of the United States Army Medical Corps* by Edgar Erskine Hume, Johns Hopkins Press; *Flying Squadrons* by S. Paul Johnston, Duell, Sloane and Pearce; *What the Citizen Should Know About Submarine Warfare* by David O. Woodbury, Norton.

Dave Woodbury, VI-A, shared honors with Dean Lobdell '17, as speakers at the annual spring party of the New Jersey Alumni. Eight other hexalphas were among the following members of the Class (and Fish Gilbert '19) who were present: Max Burckett, Chink Chatham, George Chutter, Cac Clarke, Pip Coffin, Sumner Hayward, Dugie Jackson, Fred Kowarsky, Lou Mandel, George Owens, Rufe Shaw, Joe Wenick, Ralph Wetsten. New officers of the Club include George Chutter, Vice-president; Ralph Wetsten, Secretary; Fred Kowarsky, Treasurer; Max Burckett and Sumner Hayward, executive committee.

Edward I. Mandell, I, has been elected president of the M.I.T. Club of South Florida. The Directory of the Alumni Association lists among club officers George W. Spaulding, VI, President, M.I.T. Association of Baltimore; Edmund G. Farrand, VI, Secretary, Technology Club of Chicago; Edward F. Praetz, II, President, Technology Club of the Merrimack Valley; Winter Dean, XV, President, Technology Association of Minnesota; Ira P. Jones, II, President, M.I.T. Alumni Association of Nashville; Charles A. Williams, VI, President, New Haven County Technology Club; Elmer W. Campbell, VII, President, M.I.T. Club of Western Maine; A. Glenn Stanton, IV, Secretary-Treasurer, The Technology Club of Oregon. Among the Honorary Secretaries are Ed Farrand, Wint Dean, Herb DeStaebler, Cac Clarke, Munnie Hawes, Irv Peck, Irv Jakobson, George Welch, Bill Sherry, Charlie Herty, and Simon Freese. Serving in various other capacities are Lark Randall, Slide Rule, Warrie Norton, Chick Kurth, Frank Kittredge, Reg Smithwick, and Charlie Briggs.

Paul N. Anderson, IX-B, President and General Manager of the Dahlstrom Metallic Door Company, Jamestown, N.Y., is receiving congratulations on the award to his company of the Army-Navy "E" for their production record in making war equipment. — Also in receipt of congratulations is Arthur Esner, II, for the record made by his son, David, in rating the highest score among 600 high school seniors from 75 southeastern schools in Emory University's scholarship contest. The Esners make their home in Miami Beach, Fla.

Homer N. Wallin, XIII-A, a captain and maintenance officer in the Navy Bureau of Construction and Repair, is credited in a dispatch from the south Pacific with the successful restoration of naval vessels. Under Homer's direction, many of the warships and auxiliaries damaged in the year and a half of warfare are being salvaged and reclaimed, some of them in record time.

The monthly résumé of military news shows 13.4 per cent of the Class in service. Of the 90 in the Army, there are two major generals, nine brigadier generals, 26 colonels, 17 lieutenant colonels, 16 majors, ten captains, five lieutenants, one chaplain, three enlisted men, and one unclassified. The Navy group totals 29, including one rear admiral, seven captains, eight commanders, eleven lieutenant commanders, and two lieutenants. One man has been decorated. Casualties include one killed in action, one missing in action, and one who died in service. For new listings and promotions read "M.I.T. Men at War."

It is interesting to note the increasing number of the Class whose cards appear in The Review's advertising. George Chutter, VI-A, Vice-president of the Hevi Duty Electric Company of Milwaukee, makes precision heat-treating furnaces. Walter J. Hamburger, II, of Tech Show fame, who went back to the Institute to obtain his master's degree in textile technology in 1941, has formed the Fabric Research Laboratories, Boston, with several other Technology men. They do the testing and consulting for textile and allied industries. Robert F. Miller, XV, official class photographer, is an industrial engineer with the management firm of Stevenson, Jordan and Harrison, Inc., of New York. John B. Starkweather, I, teams up with his father in engineering and contracting for pumping, boiler, and power plants under the firm name of Starkweather Engineering Company, Inc., Newtonville, Mass. Howard F. MacMillin, II, and Francisco L. Lazo, I, have also been recent advertisers. If we have overlooked anyone, write in, and we'll plug your product, too.

We take leave of you for the summer with the hope that you won't forget the Fund. With your welcome letters, we have been able to maintain the column without a break for the last ten years and

1921 Continued

with very few omissions in the previous ten. Our sincere thanks and good wishes to you all. — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, Federal Telephone and Radio Corporation, 1000 Passaic Avenue, East Newark, N.J.

1922

Yard Chittick has supplied the following information about the sad death of our former president, Henry J. Horn, Jr., in April. Early this year, Horn was sent to Canada on expediting work for the War Production Board. As he was to be in Canada for some time, he was joined by his wife. They took up residence in Ottawa. He had to return to Washington on a short business trip and left Ottawa by train. He became ill on the train, got off at Montreal, and registered at a hotel, going immediately to his room. Several hours later one of the hotel attendants, realizing that Horn was ill when he registered, went up to his room to see if he could be of any service. Horn was in a very serious condition. He was immediately taken to a hospital but died soon after.

The Buffalo Sewer Authority voted unanimously to appoint George F. Fynn of Buffalo as its chief chemist. Prior to the appointment, Fynn was statistician for the authority. Formerly he had been with the National Aniline and Chemical Company in Buffalo, G. H. Gautier and Company of Jersey City, and the George L. Claflin Company of Providence. We wish Fynn the best of luck in his new undertaking.

Brigadier General Clinton W. Howard is chief of staff at headquarters of the Army Air Forces Technical Training Command at Knollwood Field, N.C. Howard received his master's degree in 1922 and his doctorate in 1923.

Platt C. Benedict has succeeded Walter C. Page as deputy director of the zinc division of the War Production Board. Prior to this, Benedict was with the facilities bureau of the W.P.B. Before joining the W.P.B. early this year, Benedict was a geologist with the Newmont Mining Corporation. He spent much of his time in Canada, Alaska, and in western United States. Before his association with Newmont, he was chief field geologist for the United Verde Copper Company, working in nonferrous metals in the mining districts of Mexico and southwestern United States. Benedict certainly brings to the zinc division a broad knowledge of mining activities on the North American continent. He is another example of the many men of our Class who are helping to win the war. — CLAYTON D. GROVER, *Secretary*, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y. WHITWORTH FERGUSON, *Assistant Secretary*, Ferguson Electric Construction Company, 204 Oak Street, Buffalo, N.Y.

1923

Thanks are due to Acting Secretary Russell and Assistant Secretary Keck for keeping these dispatches coming through regularly while your Secretary was away. Now that I am back, I feel I ought to set a good example by making a report of my visit to England.

I was sent to London to observe for the United States Office of Civilian Defense. As far as Technology contacts are concerned, I reported to Dave Shephard '26, who is an Honorary Secretary of the Alumni Association and attached to the American Embassy. I had a pleasant visit with John W. Voelcker, who is a major in the British Army and is attached to the War Office. He acquainted me with a number of interesting and excellent London pubs, which proved that the English are getting along very well even in wartime. I was invited out to dinner one night to an apartment occupied by several Americans of the embassy staff in London. I was pleasantly surprised to find that another guest was H. C. L. Miller, Jr. He is No. 2 man in Lend-Lease under Stettinius and was in London on a short mission. We had a lot of fun identifying each other, as the last time we had met was in front of the mail desk at the Roosevelt Hotel in New Orleans some seven or eight years ago.

I seemed to have escaped a tough New England winter. I was glad to find the grass and foliage green in England in January. Although it does not freeze very often there, the winter weather can be quite cold and not too pleasant. I was told, however, that the past winter was the best London had had for many years. There was even quite a lot of sunshine.

I found London quite attractive. Many parts reminded me of Boston. Londoners said they felt the town looked quite shabby, but I would not have formed any such opinion on my own. This is not wholly a matter of bomb damage, for there is also the fact that little in the way of labor or material has been released for maintenance. Even in wartime, London's transportation system, including underground and bus service, is very good, and the suburban train service is excellent — better, I should say, than would be available in any of our American centers.

While the number of private cars is reduced, there is considerable street traffic and adequate taxi service in the city and in the West End. London taxis are not gas burners such as ours. Their motors are relatively low powered and can get a great deal of mileage, so a fair degree of service has been maintained. In one respect, London taxis are superior to our American ones: They are comfortable to ride in, and you can even sit in them with a hat on. They set fairly high off the ground, and on going around corners appear to make a series of sideways hops. I often wondered where Charlie Chaplin figured out the series of hops by which he shuffled around a corner. I know he was brought up in London, and now that I have seen London taxis take corners, I have put two and two together and decided that is where he got the idea.

I am often asked about food in England. I can report that the food is quite adequate, though I lost 20 pounds in four months. I could stand it, and it was no reflection on the food available. There is some lack of variety, of course. Meals are standardized by government regulations to three courses: a soup, an entree (sometimes meat and sometimes fish), and an alleged sweet. Certain things are short, as is evidenced by the following conversation I heard one morning at breakfast in the dining room of my hotel. The waiter was asking a lady at the next table whether she would have sausage, a kipper, or a fried egg. She said, "A real fried egg?" The waiter said, "A real fried egg." She replied, "I'll have a fried egg." On the credit side of eating is the excellent bread and beer available. The bread is a loaf made on government specifications and has real flavor, something generally lacking in the ordinary white bread with which we are familiar in this country.

I brought away a number of interesting pictures of things I had seen in London. One of the most impressive was a session of Parliament in which I heard the members put 75 questions to the ministers in a period of 60 minutes. The questions were all provocative, and for the most part the members who put them received satisfactory answers.

The other incident I remember was a Sunday crowd in Hyde Park watching a bunch of American soldiers and sailors play scrub baseball. The players were not limited to enlisted men. I saw among the players a captain and a lieutenant with their coats off and sleeves rolled up. I imagine that the game must have been unintelligible to most of the spectators.

In a considerable number of instances the Americans regularly attached to the embassy staff participate in many of the routine wartime duties that any other resident of London might perform. Some of these take their regular turns in firewatching in the building they occupy, and I learned of one member of the embassy staff who belonged to a unit of the Home Guard.

There are Americans all over England, mostly in the Army. For the most part they get along very well with the British. Some Americans are considered by the British to be a bit bumptious. There is a story about an American private who was one of this sort. While on leave, he walked into a small hotel in a town in Scotland to book a room for the night. He approached the inquiry desk, behind which a little Scotch girl was working on some papers. She did not immediately look up, so the American soldier banged on the desk and said, "How about a little attention? Who do you think is winning this war, anyway?" The little girl looked up, smiled sweetly, and said, "Why, pardon me, I didn't catch your Russian accent." The folks there can take care of themselves.

On getting back to this country, I noticed particularly that there is no feeling of the war here such as you have in England. It may be that there air raids occur frequently enough to let the people know there is a war on; it may be the earnestness with which a people who have been at war four years are at work,

1923 Continued

as distinct from the casualness of a people who have not been in the war long enough to throw off that casualness.

There is one definite difference, for example, between Washington and London. In London when you see somebody in a government agency working on something you are interested in, you can assume that he is the one to talk to about it. They have not enough men to spare a half-dozen people to work on the same problem. If you want to exasperate any of the Americans who have been in London working with the British on war problems, just ask any one of us hopefully if we think that the war will be over this year. — HORATIO L. BOND, *Secretary*, 457 Washington Street, Braintree, Mass. JOHN M. KECK, *Assistant Secretary*, 207 Bloomfield Avenue, Bloomfield, N.J.

1926

In recent months, members of the Class have been in the public eye, in the press, and on the move. Mac Short, Vice-president in charge of engineering of the Vega Aircraft Corporation, Burbank, Calif., has been elected president of the Society of Automotive Engineers. Shortly after leaving the Institute, Short, who is recognized as an extraordinarily able designer and builder of airplanes, became one of the founders of the Stearman Aircraft Company of Wichita, Kansas, and for ten years was vice-president and chief engineer of that company. He organized and became president of the Vega Corporation in 1937, and relinquished administrative duties in 1940 to devote his full time to aeronautical engineering and further development of Vega-designed aircraft.

Wesley Hemeon has been appointed industrial hygiene engineer on the staff of the Industrial Hygiene Foundation of the Mellon Institute of Industrial Research at Pittsburgh. For the past seven years, Wes has been with the Massachusetts Department of Labor, where he has acquired a wide reputation as an authority on industrial ventilation. On the foundation staff he will participate in plant hygiene studies, specializing on ventilation to control health hazards. — Leonard V. Phelps has been appointed head of the Bureau of Vital Statistics in West Virginia. For a number of years he was a member of the staff of New York's Vital Statistics Bureau. — A. F. Horle has been appointed superintendent of the American Smelting and Refining Company's new Las Coloradas plant at Parral, Chih, Mexico. Horle was assistant general superintendent of Cia. Minera Asarco.

George Smith, who is now in the chemistry division of the War Production Board and whose contacts among the Class steadily widen, has written from Washington as follows: "When I first arrived, Mooney Owen took me under his wing and did a great deal toward orienting me in this bustling city, but because of stricter gas rationing, I haven't seen much of him recently. I met Captain Wick Eddy at an M.I.T. dinner here, and afterward he came out to spend the evening with us. Ken Lord was here in the War Production Board until a few months ago, when his company, the Reliance Electric and Engineering Company, required his services in Cleveland. Ken still gets here on business now and then, and he dropped into the office recently. Jack Larkin is in the steel division of War Production Board, and I have talked with him over the phone. We faithfully promised to have lunch together soon, but that was several months ago. Even getting together for lunch in an organization as large as this seems to be difficult. I ran into George Edmonds, who was visiting the chemicals division, and he did not appear to have changed a great deal during the ten-year period that had elapsed since I had last seen him. Bill Lowell evidently gets to town frequently but he has no interest in chemicals, and as a result I have thus far only talked with him over the phone. One regular visitor to the chemicals division is Bob Ries of Du Pont. Bob obtained his doctor's degree with the Class. Many of us in Course XV-3 remember him as our chemical engineering instructor during our senior year."

The Secretary had a pleasant note from Ben Margolin, who is now at Fort Lauderdale, Fla. — Dean Lobdell has recently had word from the Middle East, where Major Robert E. Mattson has been located since last autumn. He has been transferred from the Corps of Engineers to the Transportation Corps. His present assignment is command of the railway operations battalion of the Trans-Iranian Railway, a job which is equivalent to that of a division superintendent. He is said to have his own business car (a remodeled caboose) and to have attained a state of influence and importance which entitles him to his private jeep and driver.

A letter from Bob Dean located him in Georgia, though the Secretary recently heard that he is in Columbia, S.C., along with Ken Billings. Both of them are lieutenant colonels. — David Powers is now a captain in the Army and is stationed at Oregon State College. — Bert B. Williams, another Course I man, is a professor at The Citadel, S.C.

With great sorrow the Secretary must report the death on May 4 of F. Gurney Fine, a captain in the Army since last autumn. He died in the Hoff General Hospital at Santa Barbara, Calif. Shortly after Gurney was married last autumn he had an emergency operation for a ruptured ulcer. After his recovery, he underwent further surgery because of an abscess on the liver. Later in January a third operation became necessary, and from this he did not recover. Before going into the Army, Gurney was in the insurance business in Philadelphia. Since 1931, he had served as an Honorary Secretary for M.I.T. and on the regional scholarship committee. We shall miss Gurney acutely, and in his death the Class has lost one of its most beloved and respected members. — JAMES R. KILLIAN, JR., *General Secretary*, Room 3-208, M.I.T., Cambridge, Mass.

1930

Two more class babies bring our congratulations to their proud parents! On April 28, Fred Trescott, II, became the father of his first child, Alfrieda, and a daughter was born to the George Lawsons, VI, on May 9. Linda Lawson has a brother George, one year old. Fred is a ventilating engineer at Bethlehem's Fore River shipyard and George is factory engineer for Sylvania in Salem, Mass.

A special guest at the Alumni Council meeting in April was George Shrigley, XV, who is with the War Manpower Commission in Boston. Before the war, George was unemployment commissioner for Massachusetts, but unemployment problems are indeed scarce these days. George is married and makes his home in Wellesley Hills.

We cannot conclude this issue of The Review without saying a word of appreciation to those members of the Class who did their bit in last year's Alumni Fund drive. Our showing was mighty good, and we'll have to continue the performance and try to better it this year. With so many classmates in the armed forces at greatly reduced salaries (apologies to those of whom this is not true), we who remain in industry will have to send along a few extra dollars to keep our class standing up where it belongs. Best wishes and good luck to all of you until next fall, when I hope to have letters from you to fill this column with news. — PARKER H. STARRATT, *General Secretary*, 1 Bradley Park Drive, Hingham, Mass.

1937

George Levy is a captain in the Chemical Warfare Service, stationed at Camp Sibert, Ala. He wrote: "For several years, I have been reading The Review and have naturally taken special interest in the whereabouts of our fellow classmates. I feel it is now my duty to try to add a little information. The first of January this year found me wending my weary way to the land of rain and mud. I was sent from the Chemical Warfare Service development laboratories at M.I.T. to Camp Sibert, Ala., the only place in the world where you can stand knee-deep in mud and still have dust blow in your face. Camp Sibert is the new home of Chemical Warfare training. Units have an opportunity to train here as units, to prepare to fulfill their mission in the field. When I arrived, I was made a battalion commander and then was put in command of a field laboratory company. After that was activated, a major took over command, and I am now waiting to activate a new unit.

"Here at Sibert is Ray Dresselly, who is a captain in the replacement training center. Lieutenant Pierce arrived about a month ago. Len Seder, who is still with General Electric in Lynn, and Irwin Sagalyn, who is working with United Can, are the only other '37 men whom I have seen in the last few months. Bob Gordon is a lieutenant in the Navy.

"Today is a day for reminiscing. The sky is clear, the temperature perfect, and

1937 Continued

the slight breeze is just the kind that is excellent for sailing on the Charles. Oh, for those carefree days 'with nothing to do but analyze air in an aneometrical top,' or to listen to good old F.A. and his discourse on how to pick a wife, or Doc Lewis' lectures which always contained something 'irrelevant, immaterial, and of no consequence.' All my best to all my classmates. Let's continue our good work." Thanks, George. Word from you any time will be more than welcome. Best of luck from us all.

The following came from Shaw Field, Sumter, S.C.: "Promotion of Lieutenant Harry Corman of Boston, Mass., to the rank of captain was announced today by Colonel Burton M. Hovey, commanding this huge Army Air Forces basic flying school. Captain Corman, who in civilian life was a Boston civil engineer, is a flying instructor here. Before reporting for duty at Shaw Field in October, 1942, shortly after receiving the wings of an Air Forces pilot, Captain Corman was assistant operations officer at the Bangor, Maine, air base. He has been in the service since 1940. Captain and Mrs. Corman list their Boston address as 27 Ormond Street, but in Sumter, S.C., they reside at 430 West Calhoun Street." Our congratulations to you, Harry, and may you continue to go higher and higher.

At a General Electric science forum recently, Charles E. Reed, Sc.D., who is consulting chemical engineer of the General Electric research laboratory in Schenectady, N.Y., recently gave an address on the subject of the manufacture of synthetic rubber, in which we are all interested. Dr. Reed said the synthetic rubber program is the only way America can produce enough rubber in time to avert "a serious rubber crisis next fall." Therefore, the manufacture of synthetic rubber must be the nation's "major plant expansion problem during 1943."

Jackson Balch, a lieutenant in the Army, and Janet Victoria Diehl of Wilmington, N.C., were married on March 6. Robert D. Morton, an Army captain, and Mary Thatcher Worthen announced their engagement in April. Morton was with the Bethlehem Steel Corporation before his induction into the Army. He is now stationed in Hartford. — WINTHROP A. JOHNS, *General Secretary*, Route 1, Bellemead, N.J. PHILIP H. PETERS, *Assistant Secretary*, 10 Babson Park Avenue, Wellesley Hills, Mass.

1938

Digging into a dark corner of the deep desk drawer, your correspondent has just pulled up an amazing array of interesting items. We still have a letter from Bob Park which we are using as a source of news. Bob just can't seem to get away from the old oil, for he is now one of the officers in an engineering petroleum-distribution unit at Camp Claiborne, La. Gus Strom has been one of Bob's instructors at camp. In March, Bob was married to the former Dorothy Nagle of Houston and the University of Texas. The Parks are now living in Alexandria, La. — Burton Aaronson was married in May to Roberta Barron of Brookline. Burt is now an ensign in the Naval Reserve.

On April 3, Mahlon Winter was married in Kansas City to Mary Franklin Claybrook of the old home town — Chambersburg, Pa. Mahl is a supervisor at the Glenn L. Martin airplane plant at Omaha. We believe the couple are living at the Fontenelle Hotel in Omaha.

Your Secretaries were stunned with surprise to find the "ice" on the finger of Louise McKinney at a recent cocktail party in Newton. Ira Lohman seems to have crossed up your Assistant Secretary by this recent strategy. Louise is a Wellesley graduate. Ira, a captain, is at present at Camp Davis, N.C.

Helen Patterson of Rochester, N.Y., is engaged to John Vasalle. We believe the wedding took place in May. Ensign Vasalle has been a Navy instructor in New York City. — Paul Sullivan has finally caught up with our predictions and has become engaged. The girl is Kathleen Whoriskey of Cambridge and Wheelock College. Paul is now in the Navy, stationed at Patuxent River, Md.

Dave Acker is still working at B & B Chemical Company and is living in Somerville. The Ackers have a one-year-old offspring. Dave reported that Peer Cody is in the nitrogen division of the Solvay Process Company in Virginia. — Dick Bartels, who is stationed at Pine Bluff Arsenal, Ark., also has a daughter.

J. Herschel Fisher has been called to active duty with the Navy. He received his master's degree in '40, and has since been doing outstanding architectural work in the Southwest.

A card from Lou Bruneau reports his travels-in-training around half of the South. He is now with a finance detachment at Barksdale Field, La. Lou says there is a swimming pool and a nine-hole golf course near by. Some life! — A card from Harvey Hecker says he has been doing design-engineering work for the Medart Company. The company manufactures rolling-mill equipment, so Harv gets into the field on service and erection jobs.

Johnny Guttel has recently been awarded the Air Medal for his service in flights in the Southwest Pacific. Johnny enlisted in the Army Air Forces in 1940, and trained at Middletown, Pa., and Craig Field, Ala. He was recently picked as a squad leader by General MacArthur's air commander.

A letter sent by Milt Wallace, from somewhere in Africa, says he was sorry he couldn't make our fifth reunion last January. Milt trained at Fort Bragg and Fort Belvoir. He ran into Charlie Mills in Africa. "We spent about an hour passing the bull and drinking a little of his Scotch (which is rather scarce out here)." Milt wants to be remembered to all the boys. — DALE F. MORGAN, *General Secretary*, Carbide and Carbon Chemical Corporation, 30 East 42d Street, New York, N.Y. RICHARD MUTHER, *Assistant Secretary*, Room 1–180, M.I.T., Cambridge, Mass.

1940

Tom Creamer has received word from Dick Dickson's father that he is a captain in the Army. Dick received his commission from the officer candidate school at Fort Knox in April, 1942, was promoted to a first lieutenant in the fall, and is now a captain.

George Kaneb wrote as follows: "I've had a change in jobs and a big change in location. I have an indefinite leave of absence from the Socony-Vacuum Laboratories in Paulsboro, N.J., and I am now with the Neches Butane Products, Port Neches, Texas. You've probably read about the butadiene plant being built here. I have a nice room right near Sabine Lake on the Gulf, and so far it has been cool enough. They tell me the weather gets plenty hot later on, so I expect it to be a far cry from New England. I've only been here a week so I haven't done much about the Texas beauties one hears about. This part of Texas is terribly crowded, and rooms are hard to get. If any of our Class are down this way, there is a spare bed in my room to which they are welcome."

Joe Owens sent us a letter, which read as follows: "It seems nearer ten than three years since our Class was shoved onto the cold, unsuspecting world! Anyway, our business has done about ten years' work in the last three. But the rush is on the way down now, so I left the business for the duration to become Ensign Owens of the Navy Bureau of Ordnance. I started training in April, and will eventually go into field service in ordnance maintenance.

"Dave Morgenthaler is a captain, no less — in North Africa at last writing. He writes: 'The natives are amused at my French, but it usually gets me what I want — usually!' Bill Hagenbuch is at Wright Field. He's with the special airborne electrical equipment division and seems to have a swell setup. Best regards to all."

Al Guttag writes that Arnie Arch was married on April 18 to a girl from Niagara Falls. Bill Richardson visited Technology the other day. He is stationed with the Army Rangers at Camp Edwards. — H. GARRETT WRIGHT, *General Secretary*, 1124 Greenwich Street, San Francisco, Calif. THOMAS F. CREAMER, *Assistant Secretary*, Room 3–208, M.I.T., Cambridge, Mass.

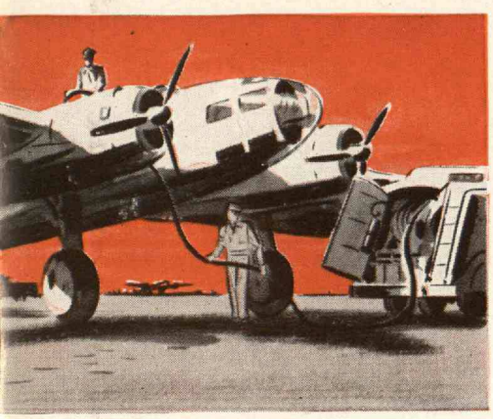
An index to this volume will be mailed free if requested by August 15

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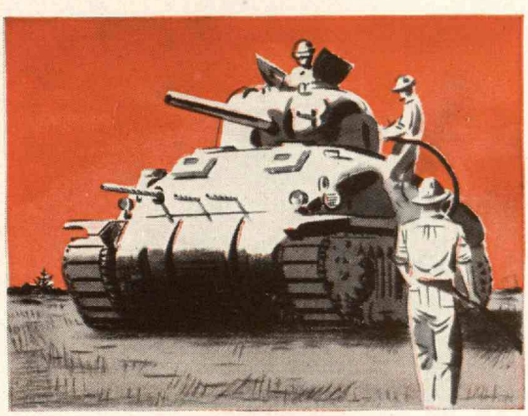
Rubber WILL RIDE TO VICTORY ON THE SEVEN C's

THE "Seven C's" are ***Conservation,*** to salvage all rubber for re-use; ***Care,*** to make what we have last longer, do more; ***Cooperation,*** in use and allocations; ***Compounding,*** to produce the best mechanical rubber goods within the limits of supply; ***Construction,*** of fabric and reinforcement so that less rubber may do more; ***Collaboration,*** of the entire Rubber Industry for the good of all; ***Courage,*** to pursue research and development relentlessly.

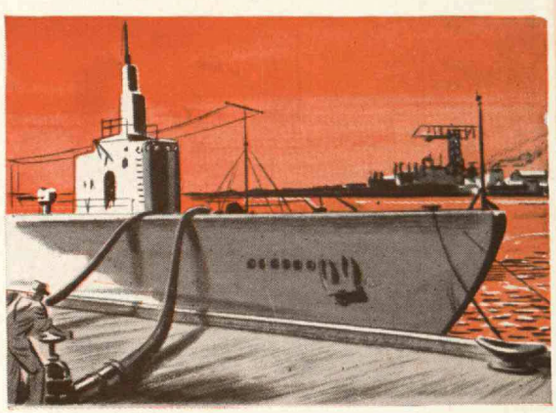
The entire mechanical rubber industry is applying its collective ingenuity, experience and skill from laboratory to shipping platform with results which, at times, may look like miracles to anyone unfamiliar with the sustained research which is an inherent part of the story of Rubber.



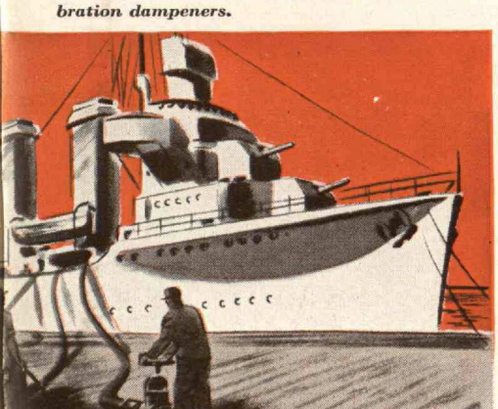
In a single airplane there are hundreds of rubber parts, including hose for fuel, oil lines and hydraulic controls; packings, and vibration dampeners.



Tanks need rubber at many points—rubber that will withstand heat, cold, oil, abrasion.



Submarines require acid-resisting rubber for battery compartments; other kinds of rubber in gaskets, mountings, and for scores of special applications.



Thousands of pounds of rubber go into every warship at hundreds of places from propeller shaft to gun decks and fire control tower.



Trucks and gun carriages require rubber for hydraulic brake parts, for shock absorption, and for other vital uses.

50th YEAR OF RESEARCH

THE half century mark now reached at MANHATTAN finds the thousands who work within its several plants too busy to take full note of this milestone in a long record of achievements. Among these are: Compensated Power Transmission Belting in which all plies have equal stresses; the Extensible Tip for prolonging the life of endless belts; the Homoflex hose construction principle which increases the flexibility and multiplies the life of rubber hose—often many times; Radio-Active treated fire hose that resists mildew; first to adapt synthetic rubber in oil-proof rubber products; Vibration Dampener Bushings for portable grinding wheels.

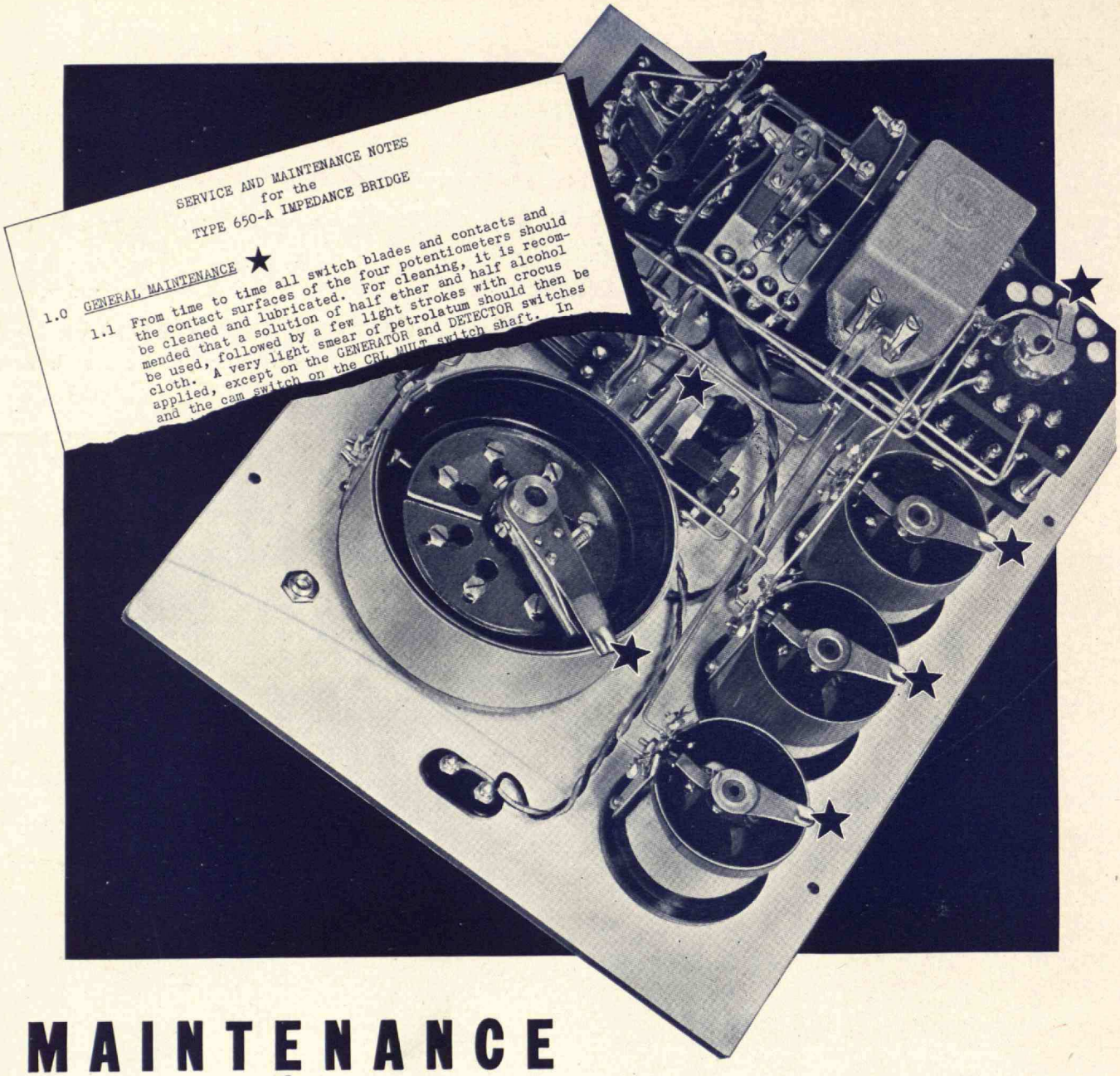
These are but a few of the MANHATTAN developments which are contributing to conservation of rubber by prolonging service life, and to greater production.

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